Riparian Protection & Community Attitudes to a proposed Linear Park & Recreational Trail along Sandy Bay Rivulet

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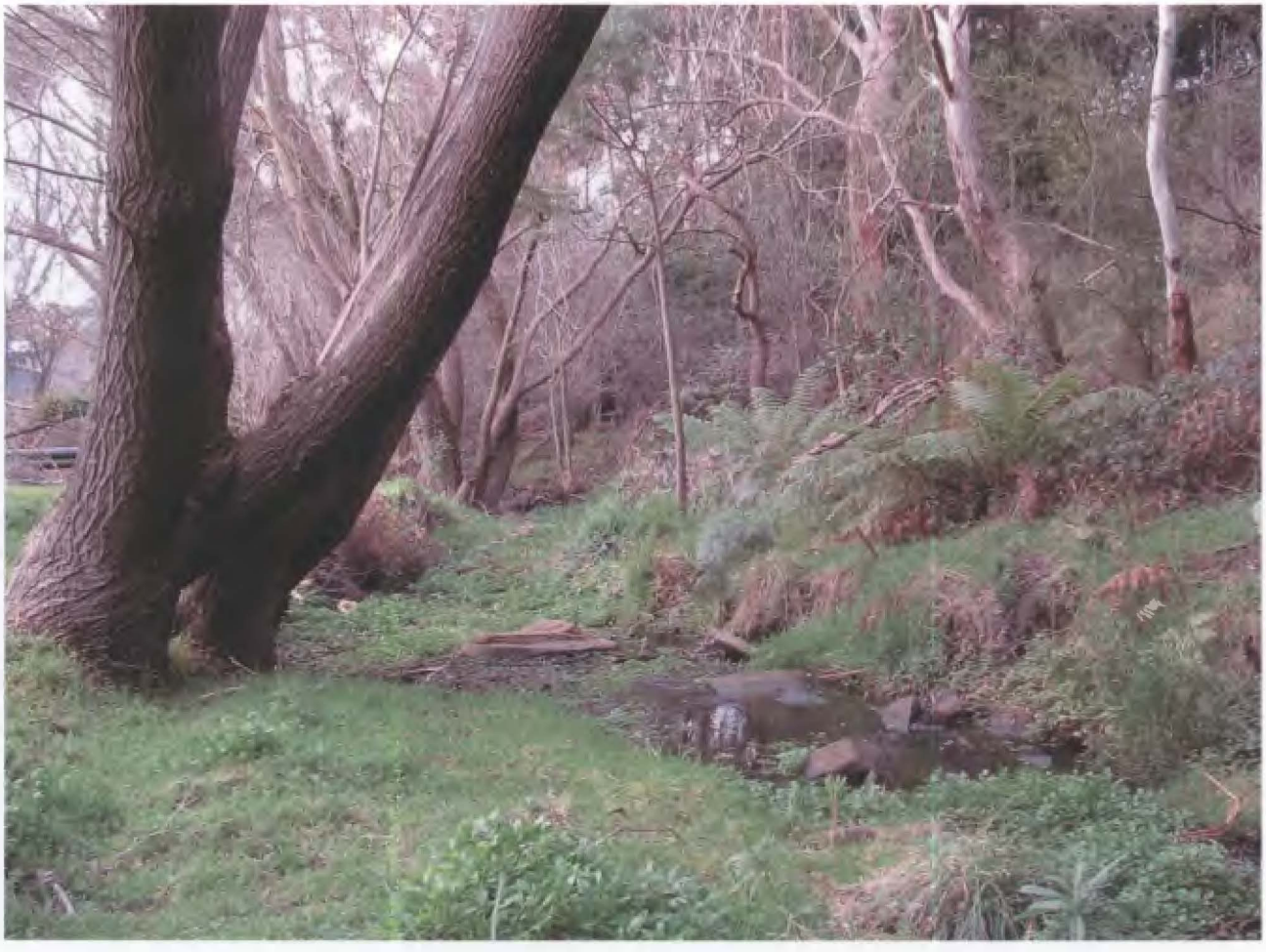

Acknowledgements

My supervisor Emma Pharo, colleagues, friends and family.

Statement of Authenticity

This thesis contains no material that has been accepted for the award of any higher degree or graduate degree or graduate diploma in any tertiary institution. To the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except when due reference is made in the text of the thesis.

George Crozier

25/7/2007

Abstract

This thesis investigates community response to a draft proposal of a linear park and recreational trail in the middle section of the Sandy Bay Rivulet, and reviews the associated planning structures and processes involved in riparian zone management and open space planning. Two hundred and sixty surveys were letter dropped to local residents outlining the proposed Sandy Bay Rivulet linear park and asking for their opinion. Seventy-two survey responses were received (28%). The research indicated that 85% of the residents support the proposed Sandy Bay Linear Park, 8% were against it and 7% were unsure. The community survey also yielded a number of recommendations. These reflect local resident's perception to land use, public access and general management of the Sandy Bay Rivulet.

In reviewing the legislation, planning and management framework of the riparian zone along the Sandy Bay Rivulet it was found that the management of the rivulet is chiefly under the local Hobart Planning Scheme 1982, and in light of the Hobart Open Space Landscape Strategy, 1994 and the Hobart Open Space Study, 1997- volumes 1 & 2. In most cases riparian setbacks are 10 m from the top of the bank. There is a general trend to widening and strengthening of the riparian zone over time, particularly with zoned bushland areas. Management by Hobart City Council is still often through development control rather than ownership. The Tasmanian Resource Planning and Development System was outlined together with State Environmental Best Practice Guidelines for managing riparian vegetation. Several management themes were covered including: a review of past reports, plans and studies, private land conservation and water management.

Recently the importance of riparian reserves has received further development through the focus on issues of water management and biodiversity conservation. The need to have adequate protection of riparian land is increasingly considered as best management practice. This may include urban, rural, and protected areas landscapes, and often involving the upper catchment. The potential to utilize waterside reserves as part of recreational open space networks, continues to evolve in landscape design and planning.

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CHAPTER 1: INTRODUCTION

1.1 Project Description and Significance

At its heart this thesis investigates community response to a draft proposal of a linear park and recreational trail in the middle section of the Sandy Bay Rivulet. It also sought to review the associated planning and management process. For a number of years efforts have been under way to extend walkway reserves along watercourses connecting Mount Wellington and the foothills on either side of the Derwent Estuary to the waterfront. The Sandy Bay Rivulet walkway reserve was proposed by the Hobart City Council (HCC) through the *City of Hobart Open Space & Landscape Strategy 1994*, and later *City of Hobart Open Space Study 1997*. The *Waterworks Valley Management Plan 1999* examined the uses and values of the area, and sought to outline an action plan to realise the project.

The *Draft Feasibility Study of the Sandy Bay Rivulet Linear Park, 2006,* was prepared by Inspiring Place Pty. Ltd. for Hobart City Council. A community survey of the draft proposal was undertaken. A copy of this community survey is included after Figure 1 –the location map. The proposed Linear Park would join the existing recreational 'pipeline track', ending at Romilly Street, to Fitzroy Gardens, approximately 2 km downstream. It would follow the course of the Sandy Bay Rivulet up the Waterworks Valley. The Waterworks Valley is a semi-urbanized area of bush land lying between the suburbs of Dynnyrne and South Hobart. It is effectively acts as a habitat corridor, linking the lower urban areas to the forested upper catchment. It connects nearby suburbs to natural areas such as the Waterworks Reserve for recreational activities, and provides a recreational area in its own right. Walking from the mouth of the Sandy Bay Rivulet, through Waterworks Valley, the Waterworks Reserve and continuing to Mt Wellington, the traveller follows a historic trodden by both Aboriginal and European settlers, who both colonized the lower plains, and used the Rivulet and Valley as a natural path up to Mt Wellington (Sinclair Knight Merz, 1999). The linear park proposal augments plans by the local Waterworks Valley Landcare Group, in conjunction with HCC, to continue to rehabilitate the rivulet. This is principally done through removal of weed species, significantly; willows, gorse and blackberries, and revegetation with native species.

1.2 Research Aim:

The research aims of this thesis are:

1) To review the riparian zone planning and management processes, with specific reference to riparian zone protection, rehabilitation, public access and open space networks; and
2) To investigate public opinion to the proposed Sandy Bay Rivulet Linear Park, open space planning, track networks and rivulet management in general.

1.3 Research Objectives:

The means of achieving these aims are through the following three objectives:

1) To review the associated legislative framework, management structures, and planning process. This principally includes; planning schemes, open space plans and strategies, 'best practice guidelines') and other relevant documentation such as catchment / management plans in relation to the Sandy Bay Rivulet, specifically it's riparian zone protection, and open space planning and management.
2) To gain a basic understanding of the study area and related issues through identifying the existing stakeholders (land-owners and uses), and the natural and cultural values. The following management themes are investigated: recreation, stormwater and water quality management, biodiversity and landscape planning.
3) To design and conduct a survey of residents adjacent to the proposed park and track route, (including a small 'slightly removed' control group), investigating community values towards riparian land-use, open space networks and the proposed creation of a Sandy Bay Rivulet Linear Park.

Figure 1. SANDY BAY RIVULET: A PROPOSED TRACK AND LINEAR PARK

LEGEND: APPROXIMATE ROUTE OF PROPOSED SANDY BAY RIVULET WALK/CYCLE TRACK.

EXISTING PIPELINE WALK/CYCLE TRACK.

CONNECTIONS

COUNCIL OWNED/ ACCESSABLE

Copy of:

Community Survey

Your opinion to land-use along the Sandy Bay Rivulet.

The aim of my study is to facilitate the better management of the Sandy Bay Rivulet and to gauge opinion on the proposed linear 'Sandy Bay Rivulet Park.' This would create a linear reserve along the Rivulet that would serve as recreational walking track.

The Council recently considered a draft report from consultants engaged to investigate the feasibility of establishing a linear park along the Sandy Bay Rivulet. The report the DRAFT SANDY BAY RIVULET FEASABILITY STUDY is now open for public comment.

The consultants report concluded that the establishment of a linear park along the upper Sandy Bay Rivulet from Waterworks Reserve to Fitzroy Gardens is possible. The report also identified significant constraints in establishing a linear park down stream of Fitzroy Gardens and recommends the creation of a recreational street trail linking Fitzroy Gardens to Marieville Esplanade as an alternative.

To view and make a submission on the Draft Sandy Bay Feasibility Study:

- Online: wwwhobartcity.com.au-under Community Notices
- The report will be placed on public display at the Hobart City Council Centre, 16 Elizabeth Street, Hobart from the 13 March-20the April.
- To receive a copy via email, telephone Councils Parks and Customer Services Division on 6238 2886.

Please see attached map of the proposed Sandy Bay Rivulet Linear Park. More detail on property boundaries can be seen at http://www.thelist.tas.gov.au. or http://maps.google.com.

(Please provide, tick, cross-out and / or circle appropriate answers.
All answers are voluntary.)

1) Does you property border the Sandy Bay Rivulet or the proposed track?

Yes No Unsure

2) Are you in favour of establishing a Sandy Bay Rivulet Park i.e. a streamside reserve accessible to the public along the proposed track?

Yes No Unsure

Please consider each of the statements below.
Circle the number that best suits how you think about each statement.

1	2	3	4	5
Strongly Disagree	**Disagree**	**Undecided**	**Agree**	**Strongly Agree**

General

3. You use and/or value bush and rivulet reserves/walking tracks, such as the Hobart Rivulet Linear park. 1-------2------3-------4-------5

4. You would like greater community involvement, consultation, information gathering and sharing, clean-up days and encourage private landowners to manage their land in accordance with plans. 1-------2-------3------4-------5

5. There should be more community walkways and open space planning networks, such as ocean, streamside and skyline recreation parks. 1-------2-------3------4-------5

6. At the Waterworks road quarry, in addition to encouraging rock climbing, provide passive recreation features such as a native garden, paths and benches. 1------2-------3-------4-------5

Sandy Bay Rivulet (see map)

7. You are in favour of restoring the streamside zone with native species. 1-------2------3------4-------5

8. You are in favour of gradual willow removal to improve water flow. 1-------2------3------4-------5

9. You are in favour of leaving it as is, with no park or walk/cycle track. 1-------2-------3-----4-------5

10. You are in favour of using the rivulet as a natural park rather than primarily for walking access to other places. 1-------2------3-----4-------5

11. You are in favour of the creation of a Sandy Bay Rivulet Park and extension of the pipeline track walkway/cycle track from Romilly Street down into Fitzroy Gardens. 1-------2-------3-------4-------5

12. You are in favour of continuing to lobby to extend the proposed par beyond Parliament Street and on to Regent Street. 1-------2-------3-------4-------5

13. You are in favour of upgrading the existing informal track for walkers. 1-------2-------3-------4-------5

14. You are in favour of upgrading the existing informal track to a cycle, wheel chair and pram accessible standard, where feasible. 1-------2-------3-------4-------5

15. You are in favour of Seek funding/subsidies for fencing and gates for affected residents. 1-------2-------3-------4-------5

16. You are in favour of strengthening Neighbourhood Watch along the Sandy Bay Rivulet. 1-------2-------3-------4-------5

17. You are in favour of more murals, such as the one under Lynton Avenue underpass. 1-------2-------3-------4-------5

18. You are in favour of re-creating a community orchard/garden, reflecting the area's history of orchards and market gardens. 1-------2-------3-------4-------5

19. You are in favour of maintain the tree sky-line. 1-------2-------3-------4-------5

20. You are in favour of interpretation panels on local history and natural interests. 1-------2-------3-------4-------5

For links or access-ways along waterways and other potential open-space networks, should council;

21. Compulsory acquire access. 1-------2-------3-------4-------5

22. Provide suitable compensation if land is compulsory acquired. 1-------2-------3-------4-------5

23. Favour voluntary agreements, partnerships and covenants for riverside and other easements. 1-------2-------3-------4-------5

24. Decrease the landowners rates and taxes proportionately if the streamside strip has shared access and management. Eg. Higher rebates for more permanent covenants, and lower rebates for less binding agreements/partnerships. 1-------2-------3-------4-------5

Other

25. What do you think neighbourhood property prices would do if the Sandy Bay Rivulet Park went ahead?

Decrease / Unaffected / Increase

26. I feel adequately informed and included in the planning process. 1-------2--------3-------4------5

Basic Demographics for profiling purposes:
(*We need to ask these questions to ensure that we get the views of a wide range of people.)*

27) Male / Female

28) Single / Couple / Family / Share-house

29) Number of children in the house? .....

30) Are you the owner? Yes / No

31) How long have you lived at this residence? .....(YEARS)

32) Age class: under 30, 31-45, 46-60, over 60.

36) Are you or have you been an active member of;*(please tick appropriate groups)*

- ☐ Hobart City Council
- ☐ Waterworks Landcare
- ☐ South Hobart Bushcare
- ☐ South Hobart Progress Association
- ☐ Friends of Sandy Bay Rivulet
- ☐ Other: e.g. water-watch through schools

Thank you for your time. Your effort in completing this survey is very valuable to the community. Please mail the survey in the stamped envelope provided as soon as possible.

If you have any other relevant comments or suggestions please write them here:

.....

.....

.....

1.4 Methodology

Summary

Local residents were letter dropped surveys to investigate community response to a Hobart City Council (HCC), Draft proposal of a Sandy Bay Rivulet Linear Park (2006), and plans by the local Waterworks Valley Landcare Group, in conjunction with HCC, to continue to rehabilitate the rivulet. The community survey of residents of along and within the vicinity of Sandy Bay Rivulet gauged public opinion to the proposed SBR Linear Park. An information sheet (see Appendix 1), community survey and map (Figure 1) where letter-dropped to 260 local residents of the Sandy Bay Rivulet. Within this group was a control group of 60 residents not living directly adjacent to the proposal.

Ethics

Prior to any surveying, an ethics application, containing all relevant documentation, was cleared through the Tasmanian University Ethics Board. This was to needed to confirm an appropriate design and to ensure that personal and sensitive questions where dealt with ethically.

Literature Review

To gain an understanding of the topic and the issues involved a literature review was conducted. Similar case studies were to be used as a reference and examples of what has been achieved and the nature of the issues that are involved. Information was acquired from published literature included books, journal's, management plans, planning schemes, thesis, strategies, reviews and reports. In order to better understand land use management processes, Tasmanian and national management strategies, planning and development systems, policies and regulations were consulted. Internet searches were widely consulted, together with libraries located at the University of Tasmania. Background information about the physical feature of the study area was collected from a wide range of sources. As the study area has been the subject of a number of reports, such as management plans, much of this information has already been collated.

The study began with a literature review of 'greenways', open space planning and management, and recreation; particularly along waterways. Initially worldwide, the focus then concentrated on Australia, and finally the Sandy Bay Rivulet within Tasmania. The interrelated and multi-factorial nature of the topic, resulted in a number of avenues of investigation including;

- the advance in awareness of issues of environmental sustainability, environmental services and biodiversity influencing riparian land management,
- current tools of management, and their effectiveness, such as reports and best practice management guidelines; including the delivery of this information to managers.
- bioregional planning and management through landscape connection and conservation networks,
- open space planning in urban, semi-urban and rural landscapes, particularly regarding the issues of 1) private land conservation and 2) land use regulation, principally through zoning, subdivision ordinances, and landscape protection within planning schemes and open space strategies/documents,

- the evolution of planning, design and management of greenways, including the financial implications on property values and trends in community attitudes and involvement,
- the associated national, state and local legislative; planning and management framework, structures, bodies and processes, and
- water management issues ranging through national initiatives, laws policies and strategies, filtering down to urban storm-water management practices and water sensitive urban design all aimed at protection of water quality and quantity and sustainable use.

The next step was to become familiar with the study area. This included a description of the physical environment such as the natural and cultural values, and reviewing associated management systems ranging from the Hobart Planning Scheme to specific local study area management plans and similar associated documentation. From this the relevant stakeholders, plans and issues pertaining to the proposed Sandy Bay Rivulet Linear Park could be identified.

Once locally relevant issues had been established they where incorporated into the community survey which was distributed to 260 local residents within the neighbourhood of the proposed park. The community survey includes a map of the proposed trail superimposed over existing title boundaries and asked a number of questions pertaining to the basic demographics such as age and sex, whether the residents directly adjoined the proposed route, whether they were in-favour of, unsure or against the proposal, what they thought of individual more specific management plans, and issues such as security, passive recreation, open space and land use. It included an open section for suggestions and comments. The surveys were conducted in March to April, 2007.

CHAPTER 2: BACKGROUND-
OPEN SPACE PLANNING: GREENWAYS & RECREATION

2.1 Water & 'Greenway' Recreation

Management of water and the adjacent riparian land is continuing to evolve, with waterway reserves becoming symbols of best practice in sustainable environmental management. Maintaining or rehabilitating the riparian zone may decrease the amount of engineering, maintenance and liability due to flooding. Within rural environments riparian zones and greenways are often comparatively easier to develop and manage due to larger land titles with fewer land owners/managers and degree of development encroachment. Urban and semi urban environments offer further challenges through factors such as: a lack of public riparian land combined with multiple stakeholders, housing and building construction encroachment, high demand and cost for land, insufficient funding for land acquisition, lack of adequate riparian protection within planning regulations and schemes, a lack of past and present open space planning, and the limitations of implementing open space planning onto the existing environment. Thus, it is not surprising that adequate riparian buffers play a role and are increasingly becoming incorporated into local authority planning schemes, best practice management guidelines, policies and strategies.

Water quality protection through urban storm-water management is continuing to develop alongside and directly affects riparian zone conservation and management. Within the urban environment, the larger area of impervious surfaces result in greater flow rates and hence erosion and flooding capacity. Characteristically, there is also an increase in pollution levels: firstly from surface runoff, chiefly from automobile exhaust and general litter, and secondarily from point sources such as leaking sewage pipes and places of industry such as service stations (Andrews, 1999). A pollution peak or first flush effect is often evident within the first heavy rains. Within urban environments the increased run off generated usually results in flow rates that largely negate any vegetative filtration.

Community attitudes to linear parks or 'greenways' is largely positive, as the local and free, nature based recreation and travel opportunities, together with enhancing the environment (e.g. aesthetics, sense of place and water quality) appeal. Yet issues such as loss of; private landownership, security and privacy may often make management and development challenging or limited. Typically these negative factors are often experienced only by a few individuals, to the benefit of the greater community. It also characteristically results in an increase in overall neighbourhood property values of 10-15% (Quayle & Hamilton, 1999), although a small section of directly affected properties may loose financial value, as well as intrinsic values. These compromised intrinsic values include loss of privacy, aesthetics and sense of place, and security with an increased crime rate.

Adequate planning, landowner and community consultation can help manage and to identify and attempt to minimize negative impacts of greenways. Stakeholder input also has the benefits of: fostering a sense of ownership by residents and users towards the greenway, resulting in increased levels of care, cooperation and maintenance, and incorporating local knowledge into design, and fully utilizing local resources including individuals and community groups.

2.1.1 Landscape ecology & Conservation Corridors

Within the global community there is a growing movement to utilize linear green corridors within planning to create landscape biodiversity networks (Worboys *et al*, 2001, Fabos & Ryan, 2004, & Arendt, 2004). This applies to altered and natural landscapes, within urban, semi urban and rural environments, and on public and private land. Conservation corridors are an essential part of biodiversity networks particularly within bioregional planning. Bioregional planning is generally recognised as an effective management style for biodiversity protection, concentrating on protecting reserves with buffer zones and corridors (Phillips, 2006).

"*To understand a corridor we must see it in context, within a larger landscape. Viewing arid, forested, agricultural, or suburban land from an airplane window or an aerial photograph, we see every point is part of a patch, a corridor, or a background matrix. Species, energy and materials move through the corridors, through the matrix, and from patch to patch. This patch-corridor-matrix paradigm, barely a decade old, has significantly enhanced our understanding and management of both corridors and the landscape as a whole. Large patches of natural vegetation remain the top conservation priority in most landscapes. But greenways can provide a crucial connectivity among parks and natural areas and can additionally protect waterways.*" (Forman, 1992, cited in Smith & Hellmund, 1993, p.vii)

"*River corridors are the most significant part of the landscape for natural protection, for recreational opportunities, and for proper planning of cultural heritage areas, at every scale (Lewis, 1964). Hence the importance of greenway planning will increase significantly worldwide in the future.*" (Julius & Ryan, 2004, p.7)

While not on a bioregional scale, the Sandy Bay Rivulet is one such example, where efforts are being made to fully utilize the rivulet as a recreation, transport and biodiversity corridor, also known commonly as a linear park or 'greenway'. The overall objective is to protect and enhance the natural and cultural values, together with creating a healthier and happier local community.

2.1.2 Fragmentation of Natural Habitat

Fragmentation of natural habitat occurs when a large expanse of habitat is transformed into a number of smaller patches that are isolated from each other. This creates habitat islands which can lead to the increased rate of local extinctions, which will inevitably occur from time to time due to chance factors. Additional reasons may be that:

- "*The remaining fragments are smaller than the minimum home range or territories needed by a species*
- *The fragments lack the diversity of habitats some species need*
- *Predators and pests may build up and invade from the cleared land between the fragmented habitats*
- *'edge species' will be unduly favoured*
- *the fragmentations may be too small to sustain balanced ecological relationships such as predator-prey, parasite-host, and plant-pollinator*
- *small populations contain less genetic variation, and are more sensitive to chance variations over time, and may be wiped out by mal-adaptive genetic drift or by natural catastrophes (Soule 1986. Wilcove et al. 1986)*" (Worboys *et al*, 2001, p. 240).

While landscape connectivity is widely recognized as contributing to help biodiversity decline some authors have pointed out the dangers and drawbacks to creating corridor networks. Corridors can promote the spread of diseases, and feral animal and plant species (Phillips 2006). Other factors such as the threat of fire events and genetic integrity are also raised by the literature, though the general conclusion is that landscape connectivity is an essential part of a healthy ecosystem.

Considering the amount and often 'high conservation value' nature of private land, is also apparent that there is a role for private land conservation to play in the maintenance of habitat corridor networks and landscape connectivity, especially when it is suburban areas encroaching on natural bushland (Phillips, 2006).

2.2 The Riparian Zone

Strictly speaking, riparian is defined as anything, usually land and its associated vegetation, which adjoins, directly influences, or is influenced by a body of water. Often the term riparian zone, does not include foreshore of oceans and large estuaries. (This is changing as the coastal riparian zone is subject to increased development pressures and coastal policy develops). In a terrestrial aquatic sense it generally therefore includes;

- the land alongside small creeks and rivers, including the river bank.
- gullies which occasionally run with surface water.
- areas surrounding lakes and ponds.
- wetlands on river plains that interact with the river in times of peak flow or flood.

The riparian zone is important because it is both ecologically and economically productive. It is an important link in the stream system and is the marginal area of the stream that provides both habitat and food for plants and animals, and profoundly influences stream bank stability. The riparian zone regulates in-stream primary production through shading, supplies energy and nutrients in the form of leaf litter, fruits and other forms of organic matter, and provides aquatic forms of habitat in the way of large woody debris (Weller, 2001).

2.2.1 Riparian Zone Ecological Functions:

Protecting Water quality
    Hydrologic Regulation
    Sediment And nutrient filtration
    Regulating Water temperature
Aquatic habitat

Riparian zone vegetation contains the diversity of native and exotic vegetation-species and communities. Riparian vegetation, depending on the definition of riparian, is also found in wetlands on river floodplains that interact with watercourses in times of flood and on land above the high water mark where vegetation may be influenced by elevated water tables or extreme flooding (Naiman *et al.* 1993, cited in Tas. SoER, 2003) Riparian vegetation has significant environmental, social and economic values that are intimately linked to roles and functions in the terrestrial and aquatic environments. As part of its terrestrial role (Tubman and Price 1999; Fischenich and Copeland 2001, cited in Tas. SoER, 2003), riparian vegetation:

- is an important source of food, shelter and habitat;
- provides travel and migratory corridors for animals, birds and insects within and between catchments;
- Generally has a higher diversity of plants and animals than neighboring terrestrial vegetation communities and therefore has a role in conserving genetic resources;

- buffers streams against nutrient, pollutant and sediment run-off;
- performs a valuable role in rainfall interception, hydraulic energy dissipation, flood attenuation and groundwater regulation;
- has deep and varied root mass which reinforces the bank and floodplain thereby reducing bank erosion and maintaining channel morphology and stability. Deep rooted vegetation also assists in maintaining water tables levels and preventing salinity;
- limits and suppresses the growth and invasion of exotic plant species; and
- withstands a large measure of natural disturbance before it loses its integrity and therefore its ability to perform its critical functions.

As well as its terrestrial functions, riparian vegetation also performs valuable aquatic ecosystem roles. Riparian vegetation is important:

- as an energy source through litterfall;
- within in-stream habitat diversity from the inputs of woody debris;
- for providing shade, regulating water temperature and reducing algal growth; and, as a source of food, shelter and habitat.

2.2.2 Urban Streams

European settlement and increased development has managed to reduce the quality of many Australian coastal streams (Leggett, 2002). Most urban streams within Tasmania receive high nutrient loads and are subject to contamination via storm-water surface run-off, inappropriate methods of waste disposal, infiltration and sewer spillages and leaks (Weller, 2001). Often urban streams were subject to the physical pressures associated with land development, often maintaining no riparian zone setback, including vegetation and options for public access.

An urban waterway should be able to support and maintain a diverse and adaptive community of organisms that would normally be found in a stream environment. The health of urban streams can be improved through establishing maintenance regimes that are proactive as well as reactive (Weller, 2001).

2.2.3 Riparian Zones and Open Space

Development control along riparian zones and open space is usually through local land use regulations (planning schemes) and open space strategies and policies. These increasingly institutionalising basic principles of site assessment, planning, and design in new model zoning and subdivision ordinance language (Arendt, 2003). They are written and implemented to pre-identify potential open space within the landscapes and new subdivisions, particularly utilizing waterways and the neighbouring riparian zone. Sky lines, ridgeways and other natural landscape features are also being increasingly protected and utilized in this way. When apply this to areas with pre-existing zoning and land uses, creating a linear corridor may involve trying to acquire or negotiate a connection along a strip containing portions of private land as well as public land. This may bring up sensitive issues of land ownership, values and uses, such as public access and private land conservation.

The direct advantages to riparian open space, i.e. waterway linear parks or 'greenways' are:

1) Recreation & Transport
2) Water Quality protection
3) Biodiversity conservation
4) Health and well being
5) Intrinsic values such as sense of place and cultural identity.

The principle disadvantages to riparian open space, i.e. waterway linear parks or 'greenways' are that individuals may loose exclusive control and public access may bring property devaluation, increased crime and loss of intrinsic values such as privacy. Other common negative side effects of greenways are centred around issues of disturbance of the biological environment such as native animal and plant species. Littering, dog faecal matter and the introduction of foreign organisms that may become 'pest' species, are common negative side effects of recreation that should to be addressed and managed. Sensitive re-vegetation in conjunction with residents can alleviate some issues of privacy/screening and lines of sight. Crime and socially unacceptable behaviour is often a management issue, and strategies to help ensure public safety have been developed. These include; vegetation height structure (limiting eye level obstructing vegetation such as bushes), lighting to promote clear lines of sight to public places and access points, not creating potential loitering points, community awareness and 'Neighbourhood watch' programs.

When there is conflict between demand for recreation and protection of biodiversity, there probably should be a very strong case for resolving the situation in favour of biodiversity as we appear to be approaching a time of biological crisis. However, pragmatic decisions dominate and natural resource management will continue to reflect a bias towards humanity. While conservation corridors or greenways are no panacea, they must be seen as one element of an integrated landscape conservation strategy necessary to maintain the many values of natural ecosystems (Noss, 1983, 1987b, cited in Smith & Hellmund, 1993).

2.3 Greenways

Greenways are connection corridors of natural linear open space or conservation areas across the landscape. They allow the flow of life and enhance both people and nature. They allow us to experience nature in our own backyards. They enhance ecological integrity, protect our waters, our wildlife, and nurture our health through recreation while enriching our community and cultural identity. Both urban, rural and often in between, they are an essential element an interdisciplinary and holistic approach to sustainable land management. Globally they continue to become recognized for their conservation and recreation purposes (Julius & Ryan, 2004, Smith & Hellmund, 1993, & Worboys *et al,* 2001).

"*Greenways can range in form from narrow urban trail corridors to very wide, wilderness-like linkages. They can straddle waterways, traverse ridgelines, or cut across upland areas independent of natural geomorphic features. They occur in different types of landscapes, from cities and suburbs to farmland and commercial forests*" (Smith & Hellmund, 1993, p.1).

"*Greenways contribute to many ecological and societal goals. They help to maintain biodiversity, protect water resources, conserve soil, support recreation, enhance community and cultural cohesion, and provide species dispersal routes during climate change.*" (Smith & Hellmund, 1993, p. vii)

Given the complexity of greenway design - involving myriad spatially and temporally changing landscape characteristics, numerous landowners, and (most likely) a public approval

process – if goals do not get translated into workable objectives, major difficulties or even project failure can result (Smith & Hellmund, 1993). Recently there have been a number of methods successfully used, and which are increasingly being advocated in greenway design. Foremost amongst the literature is the method detailed by Arendt, 2003. Principally it involves; a strategic approach, involving the community, updating subdivision and ordinance language and enabling greater densities in development areas to create open space and reduce urban sprawl.

Design usually requires consideration on a case by case basis, reflecting an understanding of site specific conditions, often principally dictated by the practical realities of land ownership. Recreation and conservation need to be weighed and balanced in order to design the most pragmatic and functional greenway. To be effective details of particular ecological processes must be considered while simultaneously integrating multiple themes such as vegetation, soil, slope and adjacent land use.

Rivulet Greenways are protected riparian corridors or buffers, requiring an interdisciplinary and ecological landscape approach, targeting three themes;

1) Wildlife conservation
2) Water resources protection
3) Recreation and open space planning

Greenways are a planned recreational and increasingly ecologically based response to the rapid increase in human land-use and development globally. They are not a new concept, but rather an underrated principle of urban and landscape planning, most recently rediscovered in the 1960's.

"*Greenway diversity also results from historical influences. In the late nineteenth and early twentieth centuries, linear open spaces were first designed as parkways, which often tied together urban park systems. During the same period, broad greenbelts were also first used to encircle cities and limit urban sprawl. In the 1960's, ecological planners and landscape architects recognized the need to protect corridors, mostly along waterways, that include a high concentration of important natural features. More recently, scientists have considered the significance of corridors for wildlife management and biodiversity protection*" (Smith & Hellmund, 1993, p.1).

In order to have the benefits of living near waterways, while minimizing the liability of flooding, canalization has been a historically favoured option. This somewhat out dated approach was championed chiefly from an engineering perspective, so as to minimize risk from flooding to development. Canalizing a stream can achieve the goal of quickly removing floodwaters from a local area, thus allowing more of the stream's floodplain to be safely developed. Yet channelization will also destroy aquatic and wetland habitats and may cause increased flood damage farther downstream (Smith & Hellmund, 1993). In contrast, maintaining streams and their floodplains in their natural state can simultaneously protect wetlands that serve as natural flood storage areas, protect aquatic and terrestrial wildlife habitat, and offer people a place for relaxation.

2.4 Riparian Greenway Design

While ecologically, the structure and function of the landscape through which the stream passes provides the most appropriate guide to designing the greenway, landownership is often the determining factor in design. Ownership largely dictates land use, management and access and without landowner consent outside management is often limited to attempting to stop riparian vegetation removal.

A riparian corridor may have many intended uses, yet the protection of water resources and environmental integrity should always ideally be the primary goal.

Several core components should always be included;

1. the natural meandering span of the stream, which we have defined as its geomorphic floodplain;
2. the riparian vegetation; and
3. the area over the stream's shallow groundwater system including any significant groundwater recharge areas in uplands outside the floodplain and riparian forest (the water table near streams is both a source and a sink for steam water, depending on the time of year and recent weather) (Smith & Hellmund, 1993).

Nodes in a riparian network, formed where two streams join, should receive special attention and ideally be protected by a wider corridor. Additional nodes may also apply when other attributes such as species habitat and recreation are applied to existing spatial information layers.

From a human perspective, Gobster & Westphal (2004) identified six interdependent 'human dimensions' of greenways: cleanliness, naturalness, aesthetics, safety, access and appropriate development. It is argued that together, these dimensions form a core set of concerns relating to how people perceive and use greenways for recreation and related experiences. Their findings "uncovered a rich variation in how the dimensions are construed by different stakeholder groups and along different reaches of the corridor" (Gobster & Westphal, 2004, p. 1).

2.4.1 Determining width

From an ecological point of view a riparian greenway may need variable widths for filtering sediments and nutrients, to help maintain natural flow regimes, and to protect significant natural features. The width of a riparian corridor should not be defined arbitrarily. The fixed widths typically set by statute as part of a stream protection programs are straightforward and easily measurable for making and implementing policy. However, an arbitrary distance from the stream typically results from a compromise between ecological, economic, and political interests. In most cases, an arbitrary width will not reflect the highly variable circumstances found along the length of any given corridor. A set width may be too narrow in some places and unnecessarily wide in others.

Numerous studies and regulations have tried to set single effective widths for a wide variety of stream types, but no consensus or magic number has emerged (Smith & Hellmund, 1993). The width of a riparian buffer should increase in direct proportion to (1) the size of the area contributing runoff, sediment and nutrient; (2) the steepness of both the adjacent slope and the riparian zone; and (3) the intensity of cultural activities and disturbances in the uplands, such as agriculture, forestry, or sub-urban or urban development. Less width may be needed when there is greater complexity, density, and roughness of corridor vegetation and

micro topography (Cooper *et al.*, 1987, cited in Smith & Hellmund, 1993). Again, width should ideally be determined after thorough scientific studies have been completed.

In Tasmania, the Department of Primary Industries and Water (2003): Waterways & Wetlands Works Manual, including the Environmental Best Practice Guidelines for managing riparian vegetation, suggests a large as possible riparian zone, based on management objectives and recommends a criteria based approach to removal of riparian vegetation (See chapter 4 for more details). It also refers to a method for stabilizing streambanks with riparian vegetation (Abernathy & Rutherford, 1999).

The reality is that widths are often determined more by existing land use than any ecological principles. In Hobart's planning scheme, riparian zone protection has progressed to 10m from the top of the bank, and 30m in selected zones, such as the Bushland management schedule. Exemptions can apply if assessment criteria are taken into account (see also Chapter 4). Elsewhere, approximately 10 to 15 meters has emerged as the minimum setback width from streams, where regulations are applied, while 100 metres is increasingly being used as a progressive measure, principally where land development has not yet occurred.

2.4.2 Critical Areas to Include

Several types of critical areas, both adjacent to and beyond the main corridor, should also be included as part of a riparian zone and given special management attention. These include; intermittent tributaries, gullies, and swales draining into the stream are critical areas because large quantities of sediment and runoff collect in them before entering the stream. The physical structure and natural vegetation in and along the side slopes of these minor drainages should be maintained. Vegetation in these areas has naturally dense growth because of good soil and moisture conditions and thus provides excellent sediment and nutrient filtration capacity.

Other kinds of critical area include, development sites, potential and actual areas of erosion or deposition in contact with the stream. These areas include steep slopes, unstable soil areas, lateral wetlands, undercut banks (especially on the outside of bends), bridge crossings, path or boat ramp access, and other locations vulnerable to increased disturbance and erosion or having the potential to act as sediment sinks (Schlosser and Karr 1981; Budd et al. 1987, cited in Smith & Hellmund, 1993, p.94). Also included are areas of intensive forest cutting, pastures or paddocks subject to overgrazing, and cultivated fields near streams

The point above the topographic levelling of flood banks, or the shoulder of the hill, can be a highly effective sediment filter due to its gradual slope compared to the banks below (Smith & Hellmund, 1993).

"*This upland area will also be a stable, long term sink for sediment and nutrients, whereas wetlands and riparian areas may eventually be disturbed by bank erosion and stream-channel meander. The edge of some floodplains consists of multiple terraces caused by very large floods in the past that deposited huge amounts of sediment. In these cases, the protected corridor should ideally extend beyond the last terrace, because this marks the point beyond which the stream is unlikely to meander in the future*" (Smith & Hellmund, 1993, p.94).

Groundwater considerations, especially aquifer recharge and discharge zones, and nearly all of the geomorphic floodplain, which help to maintain year-round stream flow, need to be protected. In some cases hydrological studies may be necessary to support the validity of the theories on groundwater movement.

2.5 Public consultation & Partnerships

Land management across boundaries requires a consultation and partnership approach. Depending on the scale, this may require cooperation across international, national, and political boundaries as well as within state or territory boundaries. On a more local scale this typically involves partnerships between councils and other stakeholders, particularly the public and local landowners.

"*Partnerships with private land owners and government organizations can sometimes produce outstanding initiatives that minimize threats to protected areas. Groups of land owners may enter into a cooperative agreement that sees the natural heritage values of their properties retained to serve as a conservation corridor between nearby protected lands.*" (Worboys *et al*, 2001, p. 240)

2.6 Recreation & Open Space Planning

In recent years, riparian corridors have become magnets for recreational use. This attraction is a result of the variety of recreational opportunities and settings that riparian corridors provide and the affinity people have for running waters. Effects of recreation on riparian corridors can include the loss of vegetation and litter layer from trampling, compaction, and reduced soil permeability and subsequent increases in runoff, erosion, and sedimentation (Manning 1979, cited in Smith & Hellmund, 1993). The presence of human beings and their pets may also disturb wildlife that utilize the corridor.

It is widely accepted that a broader range of nature based recreational experiences close to home are valued by the community at large. Neighbourhood parks are seen as the best areas for providing various recreational opportunities and services because the cost and time factors associated with travelling would not be involved in their use. This is especially the case for special (disadvantaged) groups such as the elderly, the handicapped and young children, and those without private transport. Multi purpose centres in combination with active and passive recreational opportunities are fundamentally important in maintaining vibrant, healthy urban landscapes and communities (SCSA, 1997).

Ideally, sections of residential areas should be set aside for development as neighbourhood parks and open space recreation networks, utilizing bushland, water ways and other natural features such as ridgelines. Trends are increasingly changing, yet in many cases, traditional community development practices fall short in providing recreational opportunities in conjunction with sustainable land-use practices. The need for water, sewers, lights and streets is well conceived in advance of a community development. Yet the need for open space, bushland, play areas, community centres, sports fields, and other recreational amenities is still often ignored during planning, and is left for public agencies and councils to address after the initial development. Given the financial constraints placed on these recreation agencies, due to their perceived low priority of recreational services, it is increasing difficult for these agencies to effectively manage the increasing recreation demand - particularly if the financial responsibilities for acquiring and/or facilitating their creation and maintenance continues to rest with them (SCSA, 1997).

2.6.1 A New View on Sustainable Urban Living

In the long run, corrective measures will require a complete reordering of urban lifestyles and government systems – a task that is certainly in order, and one that will require time and great effort. In considering such a task, requirements for housing, employment, marketing, transportation, energy, education, and other basic needs will have to be evaluated.

Only then will progress towards a healthy urban environment evolve. It is important to recognize that this action is already underway. But it is also important to realize that the quality of life as defined in terms of recreation has not yet fully emerged. A major step forward can be achieved by bringing urban recreation to the forefront as a priority.

Without that initial step, attempts to adjust and alleviate urban recreation problems will be inefficient and ineffective. In the past this often seems to exemplify the state of urban recreation management in Australia and much of the western world. While there are stellar examples of what is being achieved in greenway design and implementation, these are still often the minority and usually involve dedicated individuals and groups often working in isolation on specific projects.

2.6.2 Open Space versus Park

"*Open space does not necessarily mean parks. Parks are usually acquired by public agencies for public use. In contrast, the best means for providing open space lies in self-imposed or public agency-imposed land-use regulation of privately owned lands. Parks can be viewed as active resources for public use, open space as passive resources that protect viewsheds, airsheds, and natural ecosystems. The park and recreation agencies acquire, develop, and operate parks; the planning and zoning authorities regulate open space. Parks are provided by all levels of government and the private sector; land-use regulation of private land is a state-enabled police power usually delegated to local governments*" (National Urban Recreation Study, 1977, p. 30).

While U. S. (Los Angeles) based, this national urban recreation study, is widely applicable to urban planning and management within Australia. Open space in a metropolitan sense is best addressed in a strategic framework prior to analysis of individual areas and community involvement (Chapman, 1997).

2.6.3 Approaches to open space and bushland management.

As part of 'The City of Hobart Open Space Study', (Chapman, 1997, p. 23-25), approaches to open space and bushland zoning management in each state were summarized. In summary, the planning mechanisms used to protect open space and environmental areas are essentially the following planning controls:

a) land use regulation through zoning and zoning intent and ,
b) local planning policies, and
c) strategic plans.

Notably, in Victoria, controls are reinforced in areas of sensitive conservation value such as waterways where buffers zones to 100m are applied (Chapman, 1997).

Improving open space linkages values and bushland conservation preferably requires adequate zoning and zoning intent and/or the ownership of the land to be managed. The mechanisms to achieve this typically involve;

- open space contributions (particularly through sub division ordinances),
- acquisitions,
- land exchange,
- transferable development rights,
- bushland levees.

CHAPTER 3: STUDY SITE

3.1 The Sandy Bay Rivulet

Starting at its source, below *the Springs* (at an altitude of 580m), on the pristine slopes of Mt. Wellington, the Sandy Bay Rivulet flows approximately 7.5 km and finally surrenders itself to the Derwent Estuary at Marieville Esplanade. In so doing it forms the Sandy Bay – Battery Point boundary. It drains two catchments, namely the Sandy Bay and Ridgeway, which are 576 ha and 136 ha respectively (Jacobus, 2001).

"*The character of the landscape surrounding the rivulet is diverse, and includes areas of forested land along the Pipeline Track, open rural land around Romilly Street, a formal European park landscape at Fitzroy Gardens, and the inner urban landscape of Queens Street, Sandy Bay. The rivulet itself also changes from a natural stream with significant habitat values, to a waterway compromised by environmental weeds, to an open concrete stormwater channel in the lower Sandy Bay area*" (Draft Feasibility Study, 2006, p. 1).

"*The suburb of Sandy Bay was first settled during he latter half of the nineteenth century. The area was renowned on the one hand, for its lack of industry, and on the other hand, for the many orchards and nurseries that were established within its locality.*" (Crawford & Ryan, 1988, cited in Jacobus, 2001)

Industries are absent from the catchment except for four old and disused quarries located at Ridgeway Reservoir, Waterworks Reservoir, Old waterworks Road and Stoney Steps Road. These quarries supplied the bulk of granite for the construction of the Ridgeway and waterworks reservoirs. The waterworks reservoirs were completed in 1888 and 1895, upper and lower, respectively, and were needed to supply the new town of Hobart (Lee, 2002). This was brought about by the fact that the existing rivulets, the Hobart and Sandy Bay, were becoming increasing polluted (Crawford and Ryan, 1988, cited in Andrews, 1997).

3.1.1 Catchment Values

The catchment values associated with the Sandy Bay Rivulet include the natural (flora and fauna), cultural (Aboriginal and European Heritage) and intrinsic values held by the surrounding community and users of the catchment. The proposed rivulet park connects the surrounding suburbs to a place of natural beauty and recreation, linking the urbanized lower rivulet and the natural bush land of the upper catchment. The area is valued for its native flora and fauna, and for its cultural and recreational value to the users of the catchment (Leggett, 2002 and Sinclair Knight Merz, 1999).

"*The natural values associated with Sandy Bay Rivulet are centred on the ecological integrity of the rivulet itself. It is often rare to see a stream still existing in an urban environment, and not being replaced with pipes and culverts to hide it from view.*" (Leggett, 2002, p. 35)

The aim of conservation management is to replant native species to improve habitat in order to encourage and protect biodiversity, water quality, and enhance the area for community recreational values in the Waterworks Valley and along the Sandy Bay Rivulet. It is important that the rivulet is managed effectively, particularly to maintain the integrity of native fish populations, as the rivulet is considered to one of the healthiest in Hobart (Sinclair Knight Merz, 1999). The quality of the water within the rivulet also affects species within the Derwent as waters are received along with any contaminated sediment or discharge.

The intrinsic values people place on the Sandy Bay Rivulet area is an important factor in its management. These values are as equally important as those values that are cultural or natural. An intrinsic value can be described as something that is valued for its existence alone.

Individuals value the rivulet for the experience and uses it provides them with, such as a sense of relaxation, peace and tranquility. A natural bush area may provide hours of satisfaction for an avid bird watcher. Thus, the individual determines the intrinsic value of a location and in what way they utilize it (Leggett, 2002).

3.1.2 Current Land-use

The Sandy Bay Rivulet runs within the jurisdiction of the City of Hobart Planning Scheme 1982, and as a result all management must conform to it (see Chapter 5).

Along its course it traverses five major land-use areas, as follows;

1) the near pristine upper catchment within the Mt. Wellington Park
2) the historic light farming area called the Turnip Fields
3) the recreational area surrounding the Waterworks reservoirs
4) the Waterworks valley; a semi-urban region alongside Waterworks Road, joining the suburbs of Dynnyrne and South Hobart
5) the urbanized suburb of Sandy Bay

From the "relatively untouched forests" of the upper catchment, the rivulet flows through the suburbs of Dynnyrne, Sandy Bay and Battery Point. Land-use changes from: undeveloped, to special use (mostly protected), to light density residential, and finally to heavy density residential use. The lower reaches are effectively canalised as far up as Sandy Bay Road. The beach area at the Rivulet's mouth, around Marieville Esplanade serves as a prime coastal recreation area. The middle section, from Sandy Bay Road up to the Waterworks Reserve, is an area of limited and varied riparian zone protection, and hence compromised recreational opportunities. This is the result of several stages of riparian zone setbacks within planning regulations. The upper catchment, namely the Waterworks Reserve, is a protected water catchment area, which is also highly valued as a recreational destination. The pipeline track, starting at Romilly Street, extends up an easement, running parallel to the Rivulet, through the Waterworks Reserve and continues up the mountain to join with the existing track network within Wellington Park.

3.1.3 Land Tenure

Land in the management area consists of public land managed by the Hobart City Council, the Department of Infrastructure, Energy and Environment (road-side reserve), and private property. There are approximately 200 private properties that directly border or are affected by the proposed new section of linear reserve.

Although there is some public land along the proposed linear park as seen in Figure 1, there are issues of a lack of riparian ownership and public access. This has been highlighted in the Waterworks Valley Management Plan, 1999:

"*Of particular significance is a lack of publicly owned riparian reserve on either side of the Sandy Bay Rivulet, as is often found along watercourses. Instead, private lots on either side of the Sandy Bay Rivulet have titles extending to the middle of the Rivulet for most of its length. This severely limits the ability of the Council to manage the Rivulet and associated Riparian Zone as a public asset. Watercourses are traditionally a public asset, primarily for water supply, and secondarily as a recreation area, a use that has become attached to rivers and streams over the coarse of time.*

The undesirability of the lack of public land along the Sandy Bay Rivulet was recognized in the City of Hobart Open Space Strategy, which recommended the acquisition of

land along the Sandy Bay Rivulet to create a linear park, similar to the Hobart Rivulet." (Sinclair Knight Merz, 1999, p. 5)

The attitudes of property owners and residents within the Waterworks Valley will significantly influence the future management of the area, and a level of consultation and cooperation will be required. Every effort should be made to keep stakeholders 'on side' through information sharing and discussion.

3.2 Stakeholders

Key stakeholders in the management and potential development of a linear park along Sandy Bay Rivulet:

- Hobart City Council: responsible under the City of Hobart Planning Scheme 1982: including;
  - -Town planners and development application officers
  - - Hydraulic Engineering Unit (hydrological maintenance and flood mitigation)
  - -Bush land and Reserves Unit. (above Lynton Avenue)
  - -Parks and Recreation Unit (below Lynton Avenue)
  - -Bushcare officers
- Department of Infrastructure, Energy and Environment: management of riparian strip alongside the 'Southern Outlet' highway.
- Land owners with property that may be required to achieve the linear park,
- Neighbourhood residents close to a potential trail /linear park,
- Environmental Consultants, e.g. *Inspiring Place,*
- Community Groups, e.g.;
  - -Friends of Sandy Bay Rivulet
  - -Waterworks Valley Landcare Group
  - -Waterworks Valley Sustainability Group

Other Stakeholders:

South Hobart Progress Association
Battery point Community Group
Greening Australia
Environmental Defenders Office
Tourism Tasmania

3.3 Climate & Hydrology

The Sandy Bay Rivulet is situated within the orographic (rain-shadow) influence of Mt. Wellington. The prevailing westerly winds provide Sandy Bay with an average of 622.8 mm per annum. There is a marked drying out of the landscape as one travels in an easterly direction from the upper Sandy Bay Rivulet catchment. The relatively severe topography of the mountain and its foothills also means that less sunshine is received than in the east (Andrews, 1997).

"*Average monthly rainfall totals are found to be lowest between January and May, because weak high-pressure systems control the weather patterns during these times. The highest rainfall occurs between June and December, when low-pressure westerly systems and the accompanying cold fronts dominate (Bureau of Meterology, 2001)*" (cited in Tuit, 2001).

There are 13 tributaries entering the upper reaches, and 23 stormwater drains feed into the Rivulet between upper Waterworks Road and the confluence with the River Derwent (Lee, 2002). The catchment contains two dams, water reservoirs that the rivulet has been diverted around . The Waterworks Dams were originally built for the purpose of water collection and storage from Mt. Wellington and thus the Rivulet water contributed to the dam. Water supply to the dams was derived from Fork Creek and Fern Tree Bower, which is the head of the Browns River. Today the Rivulet is no longer depleted of its natural flowing waters to supply the dams (Andrews, 1997).

The Sandy Bay Rivulet has been the subject of hydrological studies by *Hobart Water*, due to the fact that there is the perceived risk of flooding due to potentially unstable geology below the lower reservoir. A mass movement (landslide) monitoring station has been established in the south-facing mudstone slope adjacent to the bottom reservoir wall.

3.4 Water Quality

The lower reaches of the Rivulet in the past would have been used as a water supply for residents of the expanding suburb of Sandy Bay. Unfortunately the rivulet was also used as a sewer until the current effluent system was installed in the 1920's (Leggett, 2002). This brought dramatic improvements, yet today the Rivulet is still too degraded to act as a water supply and a major function of the Rivulet now is being a conduit for urban runoff from the increasing number of impervious surfaces, which act to hasten the Rivulet's degradation.

The catchment contains an extensive sewage system covering the majority of houses within the catchment. The exceptions are a few houses in the upper reaches of the catchment above Waterworks Reserve and at Kooyong Glen using separate septic systems. Generally the sewage network follows the natural drainage lines and therefore parallels drainage of both the Rivulet and the stormwater. The Hobart piped sewage network is old, being constructed in 1912, thus Hobart City Council is pursuing inspections for sewage leakages. Anecdotally, over the years those walking along the rivulet have been detected leakages, smelling usually like the result of sceptic tank overflow. Hobart Water Inc. has had some impact when it periodically flushes pipes in the upper catchment, within Waterworks Reserve. Leah Andrews (1997) examined the Sandy Bay Rivulet's water quality in her thesis and the Waterworks Valley Landcare Group conducted three water quality testing sessions. The results reveal that water quality of the rivulet is; "*degraded and that any further degradation is likely to have significant effects on its aquatic biota. Nutrients, (nitrogen and phosphorous), suspended solids and faecal coliforms exceed the Australian New Zealand Environmental Conservation Council (ANZECC) standards for fresh water aquatic ecosystems*" (Sinclair Knight Merz 1999, p. 8).

3.5 Geology

The geology has been studied and paraphrased repeatedly in other works and the following concise summary can be found in the Waterworks Management Plan (1999);

"According to Davies (1988), the lower section of the Waterworks Valley is underlain by Jurassic dolerite, with the upper reaches being underlain by Permian mudstone and siltstone. The dolerite-derived soils located in the southern section of the management area mainly consist of medium clay soils of low permeability. These soils vary in depth from 0.6 – 0.8m, are often rocky in nature, and of high nutrient quality (Fensham, 1991).

Such soils are not particularly prone to erosion, but landslides can occur on steep gradients. Major disturbance on slopes and hill crests can cause sheet, rill and gully erosion (Davies 1988). Landslides have occurred along the Waterworks Road before, and are a concern. Landslides are encouraged by the removal of vegetation or inappropriate development. The Department of Resources and Energy has completed some investigations of land slipping in Waterworks Road." (Sinclair Knight Merz 1999, p. 11).

3.6 Fauna

There is a wide range of fauna species which inhabit different stretches of the Sandy Bay Rivulet. The native vegetation of the Waterworks Valley provides habitat for 13 mammals and over 30 species of birds, and the Rivulet has abundant fish populations and is considered the healthiest stream within Hobart for aquatic fauna (Sinclair Knight Merz, 1999). The fauna of the Sandy Bay Rivulet has been documented on a number of occasions. Andrews 1997, Leggett 2002, and Sinclair Knight Merz 1999, all contain comprehensive species lists. Some of these are recognised as species of conservation significance. In reference to the proposed park, the following significant species will be may be affected. Towards this end, management should aim to limit disturbance to water quality.

Aquatic

- Common Jollytail (*Galaxis maculatus*)
- Mountain Galaxis (*Galaxis truttaceus*)
- Australian Grayling (*Prototroctes maraena*)

(These together with native short fin eel (*Anguilla australis*) and Brown trout inhabit SBR. At present funding is being sought by Dr Peter Davies (a freshwater ecologist) through Friends of Sandy Bay Rivulet Group, to mediate the tunnel under the Southern outlet to allow *galaxis* movement upstream via a 'fish ladder".)

- Anecdotal evidence suggests that Platypus may occur with Sandy Bay Rivulet and may be encouraged to return with suitable environmental remediation.

Terrestrial

- Satin Flycatcher (*Myiagra cyanoleuca*)-Species of regional significance
- Eastern Barred Bandicoot (*Perameles gunii*)-Species of significance, nationally endangered (Subject of a study by the WWVLC)
- Grey Goshawk (*Accipiter novaehollandiae*)-Species of state significance, classified as rare under the state *Threatened Species Protection Act 1995.*
- Swift Parrot (*Lathamus discolor*)-Species of significance, nationally endangered. Classified as vulnerable under the state *Threatened Species Protection Act 1995.* It favours the blue gum (*Eucalyptus globulus*) when it flowers in August to December.

3.7 Flora

A number of plant species and communities of conservation significance, as well as state and national significant weed species have been recorded within the catchment. Along the riparian zone, the upper reaches are composed of extensive natural vegetation which give way to an increasing range of escaped and/or weed species. There are several significant infestations of state and national environmental weeds including; Blackberry (*Rubus fruticosus*) English Broom (*Cytisus scoparius)*, Blue periwinkle (*Vinca major*), Gorse (*Ulex europeaus*) and Willows (*Salix fragilis*). Below Lynton Avenue, towards Fitzroy Gardens, the vegetation turns towards introduced European parkland. Similarly to the fauna, the flora has been well documented. A full description of the floral assemblages is beyond the scope of this thesis. A comprehensive list of the vascular plants can be found in Sinclair Knight Merz (1999) and Andrews (1997).

3.7.1 Catchment; including Waterworks Reserve:

The upper catchment contains the following vegetation of conservation significance:

Inland *Eucalyptus amygdalina* forest on mudstone	-State/bioregional Significant
Inland *Eucalyptus amygdalina* forest on sandstone	-State/bioregional Significant
Inland *Eucalyptus tenuiramis* forest on sandstone	-State/bioregional Significant
Inland grassy E. *globulus* forest	-State/bioregional Significant

The vulnerable *Eucalyptus amygdalina, tenuiramis* and *globulus* vegetation communities are highly significant to the region and the continued rehabilitation and restoration of the area will enable these communities to re-establish. Tasmanian peppercress (*Lepidium pseudotasmanicum*), a 'rare' native species is located nearby at Stoney Steps Road, within the catchment (Sinclair Knight Merz 1999).

3.7.2 Proposed Sandy Bay Rivulet Linear Park:

Along the riparian strip there are small patches of remnant urban bushland (*Eucalyptus obliqua, pulchella, globulus, viminalis, Acacia dealbata*) interspersed with patches of heavy weed infestation (willows, black berries, hawthorn, gorse). These small pockets of native vegetation that have remained undisturbed while others have been mediated with weeding and planting of native species, by the local Waterworks Valley Landcare Group. A remnant blue gum specimens (*Eucalyptus globulus*) within the proposed park below Kooyong Glen, is registered on the HCC significant tree data-base. Registration affords a greater deal of protection under the Clearing of Land schedule within the Hobart Planning Scheme.

3.8 European Heritage

It is thought that Charles Darwin walked to the summit of Mt. Wellington through the area (Sinclair Knight Merz, 1999). The landscape of the Waterworks Valley is also of significance, being one of the few remaining fragments of a worked rural landscape which once surrounded Hobart as a buffer between the town and the bush. The heritage associated with the early settlement in this catchment remains evident in some of the older homes and buildings that still remain in the area. The Heritage Schedule (Schedule F) in the City of Hobart Planning Scheme 1982, states that those parts of the Planning Area shown as Heritage Areas or listed on the Council's Heritage Register shall be conserved (Section F.3). Any

development that is proposed will be consistent with those characteristics of the area that contribute to its cultural significance.

3.9 Aboriginal Heritage

Information on Aboriginal Heritage for the region is scarce although it is known that the Sandy Bay Rivulet and surrounding areas were once used for foraging and hunting grounds by Aboriginal people (Leggett 2002 & Sinclair Knight Merz 1999). Rivulets were often used as tracks as they formed distinct routes inland that could easily be retraced. The bands of Aboriginal living in the Sandy Bay area and are quite likely to have used the rivulet as a 'highway' into the higher bushland areas (Sinclair Knight Merz 1999). At the turn of the 19th century, Europeans colonised the area and the Aboriginal people were forced away (Goc 1997, cited in Leggett, 2002). Extensive development and urbanization now predominates the area, however it is important to acknowledge that the rivulet area remains an important element of aboriginal history.

"*Prior to European settlement, the Mouheneenner and Nuenonne bands of Aborigines hunted and gathered in the rivulets and foreshores of the Derwent Estuary for thousands of years. The coastal zone of the river provided these people with fresh fish and shellfish where they gathered mussels, limpets, oysters and crayfish (Goc, 1997).*

The lightly wooded foothills of this region consisted of dry sclerophyll forests with an abundance of native fauna for food. The aboriginal bands of this area fed on speared kangaroo, wallaby, emu and possum. The rivulets that carved their way down the mountain side were places where aboriginal women and children searched for thick white grubs in the banksias and rotting logs that lay beside the streams (Goc, 1997)" (Leggett 2002, p.24).

An assessment of the aboriginal cultural heritage has never been undertaken (Sinclair Knight Merz, 1999).

Chapter 4: Management Themes

4.1 Community Values and Views from Previous Community Surveys

4.1.1 Waterworks Valley Management Plan, (Sinclair Knight Merz, 1999)

It included conducting a community survey consisting of the distribution of 54 surveys to all Landcare Group members and major landowners in the management area:

"One third (18) responded to the survey. Ninety four percent of respondents thought the Waterworks Valley was of high or very high value. The most commonly nominated best features of the area were the bush land setting (100%), links and close proximity to other bush land areas such as the Waterworks Reserve (78%), low level of development (30%), views and the Sandy Bay Rivulet (22%).

Worst features most named for the management area were weeds (72%), the degraded state of the Rivulet (66%) and lack of access to the Rivulet and other areas of the Valley (22%).

The results of the survey showed that the Waterworks Valley is valued highly, in particular for its quiet bush land setting and close proximity to bush land reserves. Responses also indicate a concern to restore, improve and protect the Valley's natural assets, and a high interest in the local environment. Such support for the aims and activities of the Landcare Group indicate that the local community is a willing resource for the maintenance and enhancement of the values of the Waterworks Valley." (Sinclair Knight Merz, 1999, p. 5)

4.1.2 Sandy Bay Management Plan 2002 (Leggett, 2002)

"Hobart City Council developed the Sandy Bay Rivulet Catchment plan in an attempt to improve flood management, improve water quality, strengthen the ecological integrity and increase the social and environmental value of the rivulet.

It is envisaged this management plan will provide an insight into the cultural, social and environmental values of the Sandy Bay rivulet and will provide a basis in which rehabilitative work can continue in this area" (Leggett, 2002, p. i).

Results of the community survey reveal that members of the Sandy Bay Rivulet community value the rivulet and surrounds in many ways, but particularly for its natural beauty and intrinsic value (Leggett, 2002).

"People within this community utilize the rivulet through a number of ways including;

- *Aesthetics*
- *Recreation/Play*
- *Education*
- *History/Culture*
- *Flora and Fauna"* (Leggett, 2002 p. 31)

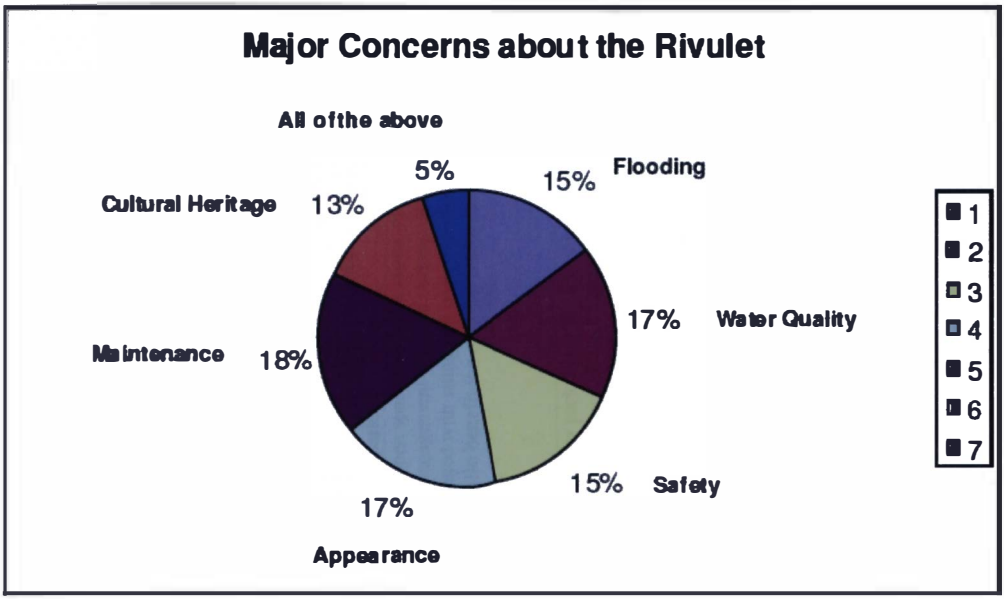


Figure 2. Major Concerns about the Rivulet. Source: Sandy Bay Rivulet Management Plan (Leggett, 2002), Appendix 3.

4.1.3 Draft Feasibility Study of the Sandy Bay Rivulet Linear Park (2006)

Prepared by the environmental consultants Inspiring Place Pty. Ltd., for the Hobart City Council, it has the following survey findings;

"It was recognized that the formation of a contiguous linear park along the Sandy Bay Rivulet would be a more complex and challenging undertaking and consequently the Council commissioned this feasibility study to investigate the potential options." (The Draft Feasibility Study, 2006, p.1)

"*Selected Landowners*

Contact was made with 10 private landowners nominated by Council following the initial investigations into the linear park and trail route. The contact was made by phone and where this was unsuccessful, a letter to invite contact was sent – 8 of the landowners responded to either phone or letter contact. All of the landowners contacted were located between Lynton Avenue and Romilly Street. The names of the landowners are not mentioned in the report in order to maintain confidentiality.

The majority of those landowners contacted indicated the potential benefits of the linear park and trail outweighed the possible impacts on individual private landowners. They considered the trail was beneficial for the whole community and considered the rivulet would benefit from increased maintenance and management resources. Several of these mentioned the wildlife values of the rivulet and bushland. Some issues that would need further consideration include location, design and management of the trail.

Two landowners were concerned about the proposal and cited loss of privacy, impact on wildlife and increased security risks associated with public access near their residential property. In both cases, the Council already owns a reserve along the rivulet adjoining their property and there was no requirement for Council to acquire land from these owners." (Draft Feasibility Study, 2006, p. 13)

4.2 Context: A Review of Past Reports, Plans and Studies

Table 1. A chronological review of past studies relevant to this study. (Adapted from *Feasibility Study: Sandy Bay Rivulet Linear Park, 2006*)

Report Title	Summary	Relevance to this Study
City of Hobart Open Space & Landscape Strategy Hepper, Marriott & de Gryse, 1994	The report outlines a long term strategy for guiding Council's future role in acquiring, planning and managing the City's open spaces.	The report identified that the existing Council Reserves in the upper section of the SBR from the Lower reservoir to the Southern Outlet should be extended so as to protect the rivulet banks, retain amenity values and offer possible pedestrian access. Other strategies include: 3.4.1 Identify and preserve historic links of human use and interest 3.4.3 develop a network of pedestrian and cycle ways throughout the City with emphasis on the development of 'sea to summit' links along major rivulets
City of Hobart Open Space Study, Volume 1 & 2 Chapman, A. W., Gulson, L. & North, A., 1997	The study is a review that develops the town planning and acquisition parts of the earlier City of Hobart Open Space & Landscape Strategy.	Aims to consider the current provisions for public open space and landscape protection with a view to amending the Planning Scheme, including; natural value conservation areas, recreational demands, and analysis of the acquisition of open space to financially consolidate the open space system. It recommends developing a SBR Linear park.
Urban Stream Management: an information manual for local government, Parts 1 & 2 Weller, 2001	Prepared by HCC, the report and manual present background information and guidelines for environmentally rehabilitating urban streams and to improve existing maintenance regimes, with an emphasis on the physical management of the water-course.	Although not mentioning recreation, open space and linear parks, the report's detailed information regarding the physical management of urban streams would be useful during the design phase of future works, associated with siting and construction of infrastructure linked to linear parks. These manuals would also benefit the ongoing management of the rivulet.
Waterworks Valley Management Plan Sinclair, Knight & Merz, 1999	This management plan was prepared for the Waterworks Valley Landcare Group and HCC, with the assistance of an Australian Government Natural Heritage Trust grant sourced by the Hobart Environment Centre. It examines the uses and values of the Waterworks Valley along the SBR and outlines an action plan for future management of these values.	The plan identifies the potential of a linear park along the upper rivulet, and provides comprehensive background assessment and action plan specific to the issues of; water quality, weed & vegetation management, fauna, heritage access, interpretation and community involvement. It includes a survey of community values to the rivulet.
Sandy Bay Rivulet Catchment Management Plan Leggett, 2002	Prepared by HCC, this management plan focuses on the more urban, lower reaches of the SBR, with an emphasis on the physical management of the water-course.	The report does not comment on public access to the rivulet or recommend a linear park, however it does emphasis the importance of the rivulet to the local community and recommends their continued involvement. It also includes a survey of community values to the rivulet.
Derwent Estuary Program: A Model Stormwater Management Plan for Hobart Regional Councils- a focus on New Town catchment	This report focuses on the management of stormwater runoff within the estuary, identifying the values, issues and threats to water quality and management options.	The report illustrates the success of the New Town Rivulet linear park, and its value to the community as a recreational resource.

DPIWE, Tasmania, 2004		
Feasibility Study of the Sandy Bay Rivulet Linear Park Consultants: *Inspiring Place Pty Ltd.*, 2006	Prepared on behalf of HCC, this study reports on investigations into the feasibility of developing a linear park extending from the Waterworks Reserve, to the Derwent River, along the SBR.	The report explores a number of options and recommends; -"The development of a linear park along the SBR is considered to be feasible and desirable from Waterworks Reserve to Fitzroy Gardens". -The development along the lower section, between FitzroyGardens and Merievelle Esplanade is not considered to be feasible, due to major constraints, in particular the high development costs, public safety issues and extensive land held in private ownership along the rivulet. -This route is instead recommended to be a 'recreational street trail'. -However, further investigations should be undertaken regarding the feasibility of a linear connection between Regent Street and Sandy Bay Road in the longer term, given the extent of land along the rivulet currently in Council ownership. Consultation with HCC staff, community groups and affected land owners was undertaken.

4.3 Integrated Catchment Management

A catchment is defined as the area of land bounded by watersheds draining into a river, basin or reservoir. Water is then channelled down the catchment via a natural water feature such as rivulet, or through underground reticulation, or often a combination of both. A floodway is defined as the channel of a river or other watercourse and adjacent land areas that must be reserved in order to discharge the base flood. An area that serves as a floodway needs to be adequately defined so that users of the area are informed of potential flooding hot spots. Public safety is of primary importance where flooding is concerned. It is essential that floodway breakout points are adequately controlled on site and areas made available for water to discharge if the volume exceeds the streams capacity. Current management of the riparian zone along the Sandy Bay Rivulet is largely influenced / dictated by the predicted 100 year flood level.

Integrated Catchment Management (ICM) is defined as:
"the holistic approach to the management of river basins and catchment areas'.
ICM provides an insight into how catchment processes are linked with nature and how people can affect those processes in their everyday activities. Central to the theme of the ICM are three distinct elements involving the protection, rehabilitation, and enhancement of the environment (Weller, 2001). ICM explores the concept of sustainability and integrated environmental management with an understanding of the ecology of river systems and their basins. Adopting the principles of ICM in environmental management ensures that natural resources are managed and protected for both current and, more importantly, future generations.

ICM can involve a range of players, some of which may include:

- communities both within and outside the catchment area
- local schools
- established community interest groups, such as Landcare and Waterwatch
- local government
- non-government organizations

Geographic Information Systems (GIS): to aid integrated decision making and due to the multi-dimensional land characteristics involved in 'greenway' or conservation corridor and network design, the layering capabilities of computer generated map programs and their ability to explore relationships between factors, are increasingly being used.

4.4 Private Land Conservation

Private land conservation programs within Australia are mostly developed through government funded initiatives (Phillips, 2006). While this is a large topic unto itself, it does have relevance in terms of option for utilizing private land along the Sandy bay Rivulet.

Phillips (2006), in her paper Conservation on Private Land: Australian local government initiatives, offers a summary of the topic which includes;

"*It was uncovered that there is a wealth of literature on the topic of land conservation on private land in Australia, however clear example of local council schemes are infrequent. There is a range of private land conservation schemes in operation around Australia, mostly having been developed through government funded initiatives. Some examples of these are voluntary conservation agreements, covenant schemes and revolving funds*" (Phillips, 2006, p.5).

"It has been well recognized that the need for biodiversity protection and conservation is growing in Australia, in both rural and urban areas. Pressures from habitat clearing and environmental degradation are having a direct effect on biodiversity. Curtis and Lockwood (2000) state that there is a clear link between the condition of private land and biodiversity in Australia, and that in some bioregions private land holds the most remaining natural areas. This clearly recognizes the commonly held view that private land is highly significant for biodiversity conservation, and brings up the concept of the 'bioregion'. Bioregional management models were developed as a response to inadequate management of biodiversity through other means of spatial categorization, and resulting bushland fragmentation. They seek to create biodiversity networks that cut across both private and public land (Figgis 2004)" (Phillips, 2006, p.8)

It comes as no surprise that a number of plans have been developed to direct local governments in how best to put conservation initiatives into practice (Phillips, 2006). Some of these incentives are listed below in Table 2.

Table 2. Some incentives that can be used by Local Councils (Bateson 2001, cited in Phillips, 2006, p.13)

Incentives	**Supporting Mechanisms**
Financial Incentives • Rates rebates • Grants or annual payment to individuals and groups • Linked to Management Agreements under local planning schemes Non financial Motivational Incentives • Local award schemes • Training for property management or whole farm planning • Technical support, materials (egg weed control) and use of machinery	Development Incentives • Tradeable or transferable development rights Property Right Mechanisms • Management Agreements, VCAs or covenants • Revolving funds Revenue Raising Mechanisms • Environmental levies (can be used to fund environmental programs) • Developer contributions

Krueckeberg (1995), cited in Lindsey & Knaap (1999), observes that "property is not just the objects or possessions or capital in isolation, but a set of relationships between the owner of some thing and everyone else's claims to that same thing" p.307. This has set the scene for many classic controversies and tensions over land and resource management, particularly involving habitat of threatened species. A recent court case, in NSW, as discussed in Taylor & Peterson (2005), indicated that local zoning intent as described in the planning process, through a planning scheme, will be upheld.

4.4.1 Private Land Conservation and Management in Tasmania:

Conservation Covenants

Across the State, covenants are conserving threatened forest communities, threatened species habitats, wetlands, grasslands and areas with other conservation values.
There are two covenanting programs in Tasmania:

1) the Private Forest Reserves Program (PFRP) (www.pfrp.tas.gov.au)
2) the Protected Areas on Private Land Program (PALP) (www.palp.tas.gov.au)

The HCC offers rebates for properties with perpetual conservation covenants. This provides benefits for ratepayers who have used covenants to ensure protection of important areas. Local Government support is vital and this measure is an important psychological incentive for landowners. It is an annual reminder that their contribution is appreciated. The rate offered is $5 per hectare, with a minimum of $50 and up to a maximum of $500 per annum for properties that have conservation covenants on their property titles under the PFRP or the PALP. In addition, Council extends the rate rebate to properties that have a Part 5 Agreements on their property titles, which protect vegetation communities that are classified as being of State, bioregional and/or local significance or threatened species habitats, by Council's bushland mapping. Such communities must be one hectare or more and abut other substantial sized areas of vegetation.

4.4.2 Private Land-use Management options for Sandy Bay Rivulet:

(Legal options for creating public access along the Sandy Bay Rivulet)

Due to the situation of inheriting a range of boundary setbacks ranging from none (i.e. centre stream or through stream) to the present day 10metre from top of bank, there have been some uncertainty on issues as to where the boundaries are in terms of land ownership, development and public access. The most notable case has been the 14 Regent Street case which has been through the RPDC and is still considered to be somewhat unresolved as the developer has had to resubmit another development application.

In 1995, the Waterworks Valley Landcare Group approached the Environmental Defenders Office seeking options for public access to the riparian zone along the Sandy Bay Rivulet. The following options were provided.

- Conservation Covenant (with Management Agreement)
- Declaration of a Public Reserve
- Sale of the land to council
- Restrictive Covenant
- Easement
- Lease
- Part 5 Agreement

The report considers it unlikely that the first two options, managed under the Protected Areas on Private Land Program, would apply to the Sandy Bay Rivulet. The more effective and secure options were considered to be sale of the land, subject to a restrictive covenant, or entering a Part 5 Agreement under the Land Use Planning Approvals Act 1993.

4.5 Water Management

4.5.1 National Water Quality Management Strategy

National Water Quality Management Strategy 1996 (NWQMS) is a joint initiative developed by the Commonwealth, State and Territory Governments under the auspices of the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) and the Australian and New Zealand Environment and Conservation Council (ANZECC). The strategy aims to provide a nationally consistent approach to water quality management (ARMCANZ & ANZECC 2001).

The strategy's objective is to;
"achieve sustainable use of the nation's water resources by protecting and enhancing their quality while maintaining economic and social development."

Within one of the suite of documents in the NWQMS, Draft Guidelines for Urban Stormwater Management 1996 have been developed. These guidelines provide a national framework for the management of urban stormwater in an ecologically sustainable manner. The Guidelines aim to:

1) Highlight limitations of many existing stormwater management practices;
2) Incorporate catchment wide issues in the decision-making process;
3) Assist the community and water managers to formulate and implement stormwater management plans that are most appropriate to local interests and takes into account the environmental, social and economic concerns of the community;
4) Promote the protection of the agreed environmental values and the need to determine the maximum concentrations and loadings of pollutants that meet the environmental values;
5) Determine the management practices across urban catchments necessary to limit the transfer of pollutants consistent with the sustainable levels.

The Draft Guidelines for Urban Stormwater Management (1996) provides the framework in which State and Territories are able to develop policies and strategies that suit their specific legislative and resource management situations (NWQMS1996).

4.5.2 Water management in Tasmania

A number of Statutory instruments are used to manage water quality in Tasmania. Chief among these are the, Environmental Management and Pollution Control Act 1994 (EMPCA), (including Environmental Protection Notices) and the Land Use Planning & Approvals Act 1993 (LUPAA). The Water Management Act 1999 provides for the development of Water Management Plans in consultation with the community. Local Government has the power under LUPAA to regulate works in waterways and wetlands.

The State Policy on Water Quality Management 1997 provides the strategic framework for the management of water quality in Tasmania. It sets a framework for setting Protected Environmental Values and Water Quality Objectives (aspirational targets) and guides the management of both point and diffuse source impacts of land use activities on water quality. The Water Policy provides a framework for the management of diffuse sources of pollution through the use of best practice environmental management guidelines or codes of practice for a range of activities that impact water quality (see chapter 5. Environmental

Best Practice Guidelines when undertaking works in Waterways and Wetlands, released by the Department of Primary Industries, Water and Environment, 2003; Waterways & Wetlands Works Manual).

4.5.3 Storm-water & Council Maintenance

Stormwater is the water that runs over the land during rainfall, carrying with it pollutants such as litter, sediment, bacteria, and nutrients. Stormwater pollution degrades water quality and habitat in rivulets and may also cause flooding and erosion. Within urban environments, the typically high flow rates, significantly limit the effectiveness of riparian vegetation filtration. Litter traps are increasingly being considered as an effective tool in removing larger articles of rubbish found in stormwater. The Hobart City Council regularly conducts monitoring of water quality, maintenance of the litter trap above the esplanade, and removal of snags and litter as part of the ongoing management of the rivulet conducted by Civic Solutions (Sinclair Knight Merz, 1999). Council's street cleaning within the catchment comprises monthly street-sweeping and once or twice monthly clearing of the gutters and drains. There is an emergency service truck available for additional drain clearing and dealing with problems associated with heavy rains. During floods, rivulets flow with heightened velocity and can transport tree branches and litter, which can cause isolated flooding thus requiring the emergency service truck to clear the debris to restore unimpeded rivulet flow.

4.5.4 Greater Hobart's Rivulet and Stormwater Monitoring Program

Greater Hobart's Rivulet and Stormwater Monitoring Program measures water quality each month or quarter in 12 rivulets and 5 stormwater drains. The program commenced in July 2002 and is a joint effort between the Derwent Estuary Program, Derwent Catchment Waterwatch and five councils, including Hobart. Monitoring allows councils to identify and manage stormwater issues for the protection of rivulets and the Derwent estuary.

Typically, summary reports from 2002 onwards, state;

"*Urban rivulets and stormwater drains in the Hobart region typically showed poor water quality, often exceeding national water quality guidelines for bacteria, sediments, zinc and nutrients. In contrast, rivulets flowing through underdeveloped land in upper, forested catchments typically showed 'pristine' water quality.*"

(Greater Hobart's Rivulet and Stormwater Monitoring Program, Summary Report: 2002 and 2003)

This has program was incorporated into the Derwent Estuary Program (DEP), bringing together a range of stakeholders; The State Government, six local councils and four commercial partners. The State of the Derwent 2005/2006 Report card states;

"*Most Rivulets showed acceptable concentrations of turbidity and suspended solids at both upper (undeveloped) and lower (urbanized) sites, under base or low flow conditions. Wet weather flows deliver far higher loads of suspended solids into waterways, and provide visual evidence of the way pollutants can be transported from land into water during rain and flood events. Levels of coliforms were of particular concern, even under dry flow conditions.*"

4.5.5 Source Controls: Water sensitive design for developments

Soil erosion and polluted stormwater runoff can be minimised by encouraging low impact development and land uses, also known as Water Sensitive Development (WSD). Some of the principles of WSD include:

- Minimise the volume and velocity of stormwater runoff and improve water quality through attractive wetlands, biofiltration trenches and storage tanks.
- Conserve water and reuse stormwater runoff for irrigation and toilet flushing (eg. rainwater tanks).
- Encourage stream bank rehabilitation and the retention of native vegetation in a catchment.
- Avoid development on unsuitable soils or close to natural waterways.
- Develop community education programs about water pollution and water conservation.
- Implement Hobart regional Councils' Soil and Water Management Guidelines (1999) at construction sites.

HCC now supplies a Water Sensitive Urban Design kit, offering further guidelines, objectives and common techniques to reduce water use and protect quality. The Guidelines are a positive contribution to:

- Reducing flood risk in urban areas and the erosion of waterways, slopes and bank
- Reducing the cost of providing and maintaining water infrastructure
- Protecting and restoring aquatic and riparian ecosystems and habitats
- Protecting the scenic, landscape and recreational values of streams throughout the city
- Making efficient use of the Tasmania's water resources.

4.5.6 Adopt-a Waterway-Program & Educational Values

The HCC is in the early stages of development of a program involving waterway cleanups, restoration, education and monitoring. Through its volunteer programs, the community will be invited to assist HCC in ensuring waterways remain healthy for the benefit of future generations by looking after the many rivulets and streams that wind their way from the heights of Mt Wellington to the River Derwent. The Sandy Bay Rivulet is in the early stages of this program with Princess Street Primary School being assigned stewardship. This is to be combined with the existing data gathered by the Waterworks Valley Landcare Group.

Potential research and educational opportunities associated with local institutions ranging from Princess Street Primary to the University of Tasmania. Given the close proximity of the both schools, the Sandy Bay Rivulet is well suited to be used as a local example in rivulet management. Although being utilized to a degree, yet there is yet scope for the rivulet to be developed further as a local educational tool. Possible area's of study include:
-Land-use planning and management,
-Urban recreation,
-experience in funding opportunities to enable on-ground management,
-exploration of cultural heritage (European and Aboriginal),
-continued water quality monitoring (University needs a faecal coliform testing kit),
-rehabilitation and ecosystem/habitat restoration,
-fauna and flora studies.

CHAPER 5: LEGISLATIVE, PLANNING & MANAGEMENT FRAMEWORK

5.1 A Guide to the Resource Management and Planning System:

(State Statutory Bodies & Principal pieces of Legislation)

Resource Management Planning System (RMPS):

This is the central legislative mechanism in the sustainable management of natural resources in Tasmania. Established in 1994, the RMPS is underpinned by a number of Acts, primarily the Land Use Planning and Approval Act 1993, and the Environmental Management and Pollution Control Act 1994. The RMPS is a system of laws, policies and procedures. It is designed to integrate State and Local Government planning (Haynes 1996, cited in Leggett 2002). It offers protection and guidelines for the management and planning of the environment

Definitions

RPDC means the Resource Planning and Development Commission.

RMPAT means the Resource Management and Planning Appeal Tribunal.

RMPAT Act means the *Resource Management and Planning Appeal Tribunal Act 1993.*

Involvement of the community, and the fair and orderly use of resources are fundamental principles of the RMPS. The RMPS objectives have been developed to advance the principles of sustainable development.

Sustainable development means managing the use, development and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic and cultural well-being and for their health and safety while:

- sustaining the potential of natural and physical resources to meet the reasonably foreseeable needs of future generations;
- safeguarding the life-supporting capacity of air, water, soil and ecosystems; and
- avoiding, remedying or mitigating any adverse effects of activities on the environment.

Use (in relation to land) includes the manner of utilising land but does not include the undertaking of development.

Resource Planning and Development Commission:

The RPDC carries responsibility for overseeing Tasmania's planning system and major new developments. This statutory body was created by the Resource Planning and Development Commission Act 1997. This in turn was an amendment to the Land Use Planning and Approval Act 1993, to issue a model framework for use by planning authorities in the development of planning schemes. The framework is designed to bring consistency to the drafting of planning schemes in Tasmania to ensure use or development is in accordance with the objectives of the RMPS.

Resource Management and Planing Appeal Tribunal:

A statutory body that resolves appeals against a wide range of administrative acts and decisions, as well as making orders protecting environmental rights and values. The RPMAT was established by the Resource Management and Planing Appeal Tribunal Act 1993.

Significant State legislation in the RMPS

1) Land Use Planning and Approval Act 1993 (LUPAA)

Centrally underpinning the RMPS and the functions for performance of the RPDC and RMPAT, this Act regulates land use and development through a planning scheme and permit system.

It enables many things, including;

- **Certification, approval and amendments of planning schemes**: planing schemes are regulatory instruments to develop, protect or conserve land in Tasmania. Every council has a duty to enforce its planning scheme. They are accessed by the RPDC.
- **The assessment of planing directives:** the purpose of planning directives is to ensure planning authorities apply consistent approaches to certain issues.
- **Development control and enforcement of agreements between planning authorities and landowners:** conduct hearings to achieve specific planing objectives;
- **Planning controls that determine what uses or developments can be undertaken within a specified area:** These controls are applied through planning schemes, planning directives and special planning orders (which are used to override provisions of an existing planning scheme or where there are no planning controls in place.)

2) Environmental Management and Pollution Control Act 1994 (EMPCA)

This Act's objective is to provide for the management of the environment and control of pollution in the State. The EMPCA establishes the Board of EMPCA as a statutory body. The Board performs a number of functions, including;

- furthering the objectives

The EMPCA;

- Provides for the control of all activities that might lead to environmental harm;
- Encourages best practice environmental management by industry, planning assessment and environmental management;
- Environmental auditing and monitoring environmental agreements, making environmental improvement programs and Enforcement measures;
- Common appeal process; A person who is a director, a planning authority, or a person who has an opinion of contravention of EMPCA, complaint of required action, or caused environmental harm can apply to the Resources Management and Planning Tribunal.

These objectives are integrated into planning process and are considered by planning authorities when carrying out environmental assessment of new planning schemes, amendments to existing planning schemes and when assessing and approving applications for planning permits.

"The *Environmental Management and Pollution Control Act 1994* (EMPCA) facilitates the protection of the environment by negotiating outcomes through environmental audits, impact assessment, improvement programs and agreements (Hayes, 1996). The Act permits the management of point sources of pollution; a major problem encountered in urban waterways. The Act facilitates a more co-ordinated approach by councils to planning assessment and environmental management." (Leggett, 2002)

The Act defines and deals with three main classifications of assessment of activities;
Level 1: An activity which requires a permit under the LUPAA, and which may cause environmental harm. Activities of this level are assessed by planning authorities with their environmental impact assessment and permit approval.
Level 2: An activity listed in Schedule 2 of the Act (the activity often has a stated minimum production threshold). Most level 2 activities require a permit under the LUPAA, although there are some that do not. Activities of this level are assessed by planning authorities and the Board of EMPC with formal Environmental Impact Assessment.
Level 3: An activity declared, by the Premier minister of the State government, to be a project of State significance an assessed under the State Policies and Projects Act 1993.

A project of State Significance takes a major development proposal outside the planning process established under the Land Use Planning and Approvals Act 1993 and other relevant legislation.

3) State Policies and Projects Act 1993

Provides for:

- the making, assessment, amendment of State Policies (Tasmanian Sustainable Development Policies);
- the integrated assessment of projects of State Significance (which are the; significant land use and state level development);
- State of the Environment Reports; a process that describes, analyses and presents scientific information about environmental conditions, trends and their significance.

5.2 Current Legislation & Management

Legally, informal reserves are addressed under Part VII (Miscellaneous) of the Crown Lands Act 1976; and formal riparian reserves are protected under the National Parks and Reserves Management Act 2002. Threatened species that occur in a riparian reserve are also protected under the Nature Conservation Act 2002. The protection of threatened species, including recovery plans, is through the Tasmanian Threatened Species Protection Act 1995 and the Commonwealth Environment Protection and Conservation Act 1999. In Tasmania threatened flora and fauna are categorised as endangered, vulnerable and rare.

Urban streams run under the jurisdiction of their local council, and are principally managed through local planning schemes (see Figure 3). Typically buffer riparian zones are set, with a discretionary clause, relating to a number of selection criteria. It is worthwhile to note that there is a movement by local councils which may representing the transition from traditional zoning practices to criteria based performances that address issues of sustainability (Leggett, 2002).

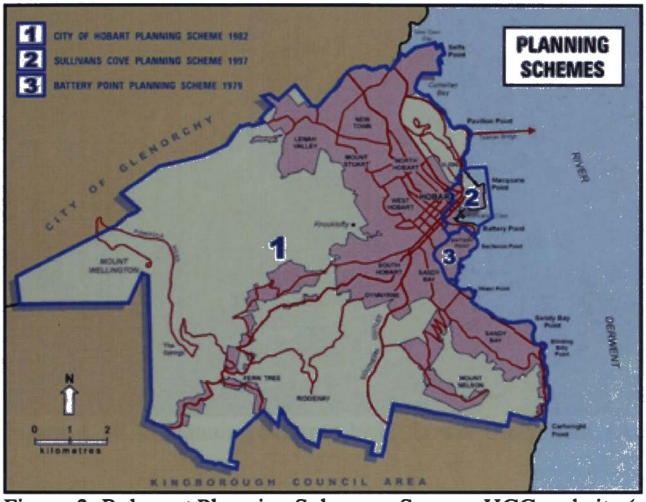


Figure 3. Relevant Planning Schemes. Source: HCC website (accessed 1/2/2007)

5.2.1 City of Hobart Planning Scheme 1982 (Administration, Planning & Management)

The Sandy Bay Rivulet runs within the jurisdiction of the City of Hobart Planning Scheme 1982, and as a result all management must conform to it. The Hobart Planning Scheme has a zone and precinct structure with specific zone objectives and statements of desired future character for specific precincts.

The Scheme also has specific controls (Schedules) on a zone and precinct basis for bushland management, siting and landscaping, clearing of land, significant landscapes, use, density, height, sitting and landscaping, traffic access and parking, heritage, signs, etc. Schedules I- Clearing of Land, and Schedule D-Siting and Landscaping (see below) are significant to management of the study site riparian zone and its vegetation, along the Sandy Bay Rivulet.

The Scheme has overarching "Principles of Development Control" dealing with such issues as use, demolition, subdivision, density, height, landscaping, traffic access and parking, town amenity and environment, and heritage. Reference to open space and landscape issues within the scheme are primarily limited to the broad Recreation Zone, Hills Face and newer Landscape and Skyline Conservation Zone.

Under the current City of Hobart Planning Scheme 1982, the management area is zoned as part of the 'Residential 1 and Reserved Residential 2, Zones' (see Figure's 4, 5 and 6). The majority of the area, is covered by Waterworks Precincts 35A and 35B, a small section of the Sandy Bay/Dynnyrne Precincts 27A, 27B and 27C, and Precincts 26A and 26B.

Figure 4. HCC Planning Scheme 1982: Lower Catchment. (Accessed 1/2/2007)

Figure 5. HCC Planning Scheme 1982: Upper Catchment. (Accessed 1/2/2007)

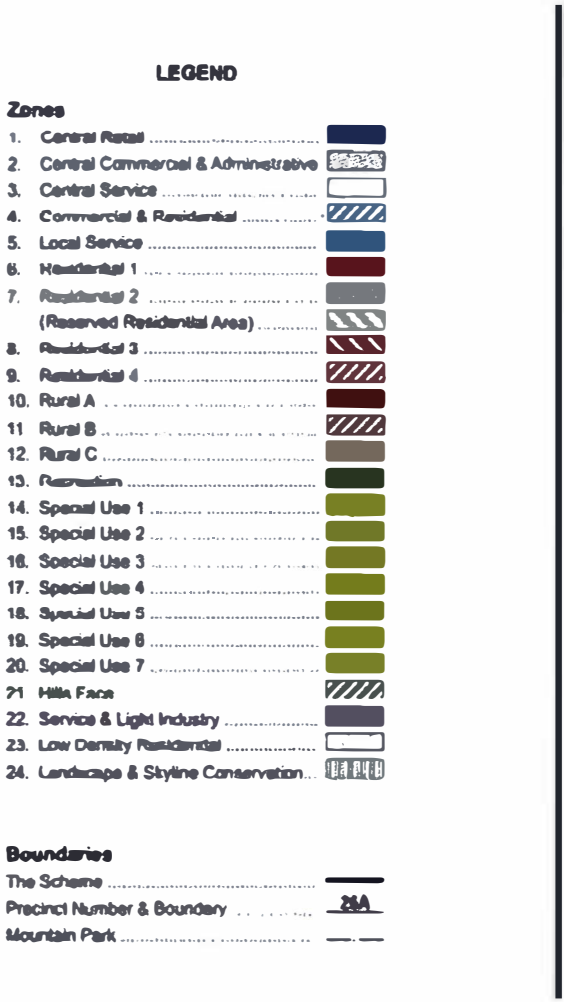


Figure 6. HCC Planning Scheme 1982: Legend (Accessed 1/2/2007)

Protection of Riparian Vegetation

Schedule I Clearing of Land in the City of Hobart Planning Scheme, 1982, states in its assessment criteria (Clause 1.4) that when considering applications for the destruction and removal of soil or vegetation, Council will take into account:

- (d) the protection of watercourses and water quality including the impact of land clearing on critical riparian areas for protecting water catchments, watershed recharge areas, springs, wetlands, flood plains, and estuaries;
- (e) the protection of the amenity value of the vegetation and the general area, including cultural landscape and heritage significance, and
- (f) the protection of biodiversity, including species, genetic and ecosystem diversity, rare, vulnerable or endangered species, habitat and wildlife corridors.

It also gives greater consideration towards trees on the significant tree register. Eucalypt species at the bottom of Kooyong Glen are currently nominated and being accessed for listing.

Protection of Riparian Zone setbacks

Rivulets and watercourse are protected under Schedule D. Siting and Landscape of the Hobart Planning Scheme, 1982. Over time there has been and increase in degree of stream and riparian zone protection with the Hobart Planning Scheme. Recent amendments to the Scheme, in the Siting and Landscape, and Bushland Management Schedules, have widened the riparian zone by starting at 'the top of the bank', instead of the former 'center of any open watercourse or drainage line'. It gives an example of the gradual strengthening of riparian setbacks (see full Schedule and amendment below).

"Schedule D. Siting and Landscape
D.6 Watercourses or Drainage Lines
D.6.1 Development shall be required to be set back as follows:

(a) a minimum of 10 meters from the top of the bank of any open watercourse or drainage line.

(b) a minimum of 3 meters from the center of any piped watercourse.

D.6.2 Council may exercise its discretion to refuse or permit any development which departs from the setbacks specified in D.6.1. Council will only approve a reduction in the specified setback where it can be demonstrated that:

a) there will be minimum adverse impact upon the environment,

b) no compromising of recreational opportunities,

c) there will be no increased risk of any hazard such as flooding, erosion or land instability level, and

d) there will be no constraint on access to a Council or other utility service."

This has recent been amended (11/2005), from;

"D.6.1 Development shall be required to be set back as follows:

a) a minimum of 10 metres from the centre of any open watercourse or drainage line."

This 'to the top of bank' amendment also includes the 30 m setback for all land within the Bushland Management Schedule. (This contains the Landscape and Skyline Conservation and Low Density Residential Zones (neither off which includes the study site)). Where proposed use or development is to be located within an existing bushland habitat, unless it can be demonstrated that there will be minimal impact on the environment or compromised recreational opportunities.

5.2.3 Hobart 2025: A Community Vision

There is a growing awareness within communities and their elected representatives within councils, of the value of community open space planning particularly encompassing ridgelines and waterways. The Hobart City Council (HCC) recently adopted a Vision for the City to assist in the long term planning to at least the year 2025. Following one of the largest consultation programs conducted for the city, the Hobart City council now has a clear pathway to plan for the future.

Council has recently endorsed the Future Direction Statements and Vision for the City, which include;

- **Achieves good quality development and urban management**

In 2025 Hobart will be a city that remains unique in its own right, protecting its built heritage and history while pursuing quality development, the principles of sustainable cities and the reduction of ecological impacts. It will value access to the waterfront, foreshores, public and open spaces and continues to enjoy the benefits of scale and proximity.

- **Is highly accessible through efficient transport options**

In 2025 Hobart will be a city that maintains its convenience and accessibility through the greater use of transport alternatives and an effective road and travel network. Improved public transport options, cycle ways and walking tracks linking open spaces for transport and recreation, the availability of adequate parking for commuters and shoppers, the take up of sustainable transport options, the reduction of through traffic and the management of an integrated approach to transport planning within the city and across the metropolitan area.

- **Is recognised for its natural beauty and quality of environment**

In 2025 Hobart will be a city that respects the natural beauty of Mount Wellington, the Derwent River, the bushland surrounds and waterfront locations. It has worked to enhance the community connection through the protection of views, vistas, access and linkages and the physical environment has been conserved in a manner that will ensure a healthy and attractive city.

Local Views

On an even more local scale, previous local community input emerged with the vision that the Waterworks Valley will be a place where;

"*Existing urban development and natural and historic features of the area are integrated, to protect and enhance native flora and fauna communities, promote local heritage and provide compatible recreational opportunities, for the enjoyment and well being of the community.*"

(Waterworks Management Plan, 1999, p. 37)

5.3 Strategic Open Space Planning within Hobart

Planning for open space is best addressed in a strategic framework before analysis of individual areas and community involvement. Within Tasmania and Australia, Under the Local Government Act 1993, Councils are required to position their forward planning within an overall framework for the future. The city of Hobart has prepared a number of Strategic Plans that present the major issues facing the community and Council's strategies and actions to address these issues. Councils Strategic Plan for 1997-2002 included;

"Council sees "a City which is in harmony with its natural surroundings, where a balanced approach to development and the natural environment is taken and best possible technologies and practices are embraced".

Inherent in this is Council's desire to take an increasingly prominent role in protecting, enhancing and promoting the natural environment. This has been reflected in the growing popularity of passive recreation activities in these areas and the need to preserve natural ecosystems.

Council has therefore recognized its overall role in the planning of the parks and reserves network as well as the need for improved guidelines for provision of open space within the planning process for development." (Chapman, 1997, p. 10)

Wthin HCC Strategic Plan 2001-2005, is the following sustainable development planning;

- *"To develop and implement a sustainable development model that promotes a balance between investment, development and the use of land through integrated urban planning, resource management and recognition of the economic, environmental and social values of the city.*
- *Review and prepare integrated new planning schemes, provisions, policies and instruments to reflect;*

1) Changing community expectations and development trends
2) State Policies and Resource Planning and Management System requirements and focus on issues such as heritage, urban design, amenity, open space, protection of the environmental resources, skylines and Sullivan's Cove.

- *Develop policies and strategies that enhance the usefulness of Council's public open space network."*

The **Hobart Open Space Landscape Strategy, 1994** – produced for HCC, by Hepper, Marriot and de Gryse -was intended to guide council's future role in acquiring, planning and managing the City's open space.

"This included an analysis of existing open spaces, identifying social and demographic trends and reviewing the results of previous studies concerning open space planning. It also recognizes the difference between public ownership of open space and the retention of some open spaces in private ownership such as golf courses." (Chapman, 1997, p. 6). It was somewhat limited by lack of information, including; HCC open space inventory was incomplete, there was no vegetation mapping and resources did not permit a landscape assessment or demographic analysis.

Specific recommendations (Chapman, 1997, p. 15) included upgrading existing linkages and development of new linkages:

- Development of water courses as wildlife and recreation corridors such as the upper section of Sandy Bay Rivulet.

The **Hobart Open Space Study- volumes 1 & 2 (Chapman 1997),** built upon this study and went into a greater level of detail; identifying opportunities and a preferred manner to realize them within the planning process. It is essentially a review and expansion of the previous of City of Hobart Open Space and Landscape Strategy. This was made possible by better funding and information such as "Johnson's Vegetation Maps of Hobart " (Chapman, 1997).

The Review's study brief required:

"1. Analysis of the current Planning Scheme with a view to revising and introducing a new range of provisions to enable the Open Space and Landscape Strategy to be implemented.
2. Analysis of the recommendations of that Strategy with particular reference to acquisitions with a view to recommending an approach to Council.
3. Completion of a detailed review of the availability of open space within New Town as a case study model of the application of Open Space and Landscape Strategy and to establish a local area plan for the future development of this area." (Chapman, 1997, p. 7)

"The principle aim of this Review has been to consider the current provisions for public open space and landscape protection with a view to recommending new provision for the Planning Scheme, which take into account:

- *Responsible conservation of natural and cultural assets of open space within the Study Area*
- *The recreational needs of residents and visitors and those who work within the City of Hobart*
- *Analysis of the financial implications for Council with respect to acquisition, compensation and management of subdivision open space contributions to provide a consolidated open space system."* (Chapman, 1997, p.7).

The methodology consisted of three components, in brief; review of the planning scheme, natural value conservation areas, acquisition of open space, and a New Town Local Open Space Study (Chapman, 1997). The study brief, given by HCC, for the Review of City of Hobart Open Space Strategy, gives the mechanisms by which this can be achieved. A brief summary is provided below:

- the inclusion of a set of principles for open space and natural values within the "Principles of Development Control";
- amending the Statement of Desired Future Character to include more specific long term objectives for open space provision, and where appropriate, the preservation of natural values;
- review of the existing Recreation Zone including its Objective to allow additional areas of bushland, rivulets and other areas of open space to be included;
- provide a model format for Natural Value Conservation Areas (either as separate Zones, areas within the Recreation Zone or through identifying both areas of known natural value conservation status and those with a prima facie case for further investigation. (Hobart Open Space Review, Chapman 1997- Appendix 1)

These two studies, both the initial strategy and the review highlight the future direction and means of 'getting there' in terms of fully realizing open space planning and development within Hobart. These studies have been accepted in part, by HCC, yet full implementation is a slow process and while there is significant policy backing open space theory, it is a often a publicly contentious issue, sometimes involving delicate negotiations with landowners. This

is especially the case of SBR when trying to work with existing on-ground realities such as applying open space planning post development, i.e. after the title boundaries, land-uses, development and infrastructure exists.

5.3.1 Open space summary

In Hobart, under the provision of the Local Government Act 1993 (Building and Miscellaneous Provision), there is a mechanism enabling Council to seek open space contributions from subdivisions. It allows for up to 5% of the land value to be set aside either as open space or cash in lieu towards the purchase of open space or improvements to open space (Chapman, 1997).

Council has adopted the Hobart Open Spaces Study and Landscape Strategy in principle only. This means council is not necessarily tied to all details as policy, but has made a commitment to the overall direction inherent in that document. Full implementation is probably seen as possibly being financially and politically challenging. Currently;

"The planning intent of the term open space is relatively ill-defined, it is commonly applied to lands used in ways which do not require significant buildings but are a major contributor to our local amenity and provide recreational opportunity.

Open space describes land used for active and passive recreation, for retention of bushland or rural residential settings and lands set aside for conservation of scenic landscapes values or conservation of habitat values. Consequently, the term is applied to areas set aside for significantly different reasons, in some instances to land set aside for no specific reason and in others for various reasons.

Areas reserved for active recreation and those reserved for conservation of landscapes or habitat values require different developmental approaches, these need to be reflected in statutory controls to ensure that are translated on the ground." (Chapman, 1997, p. 5)

and

"The open space available to the City is "protected" through zoning controls of the City of Hobart planning Scheme 1982. Two Zones highlight these areas, the Recreation Zone and Hills Faced Zone. There are however, very limited standards and objectives contained in the Scheme and they apply to developing these areas with no explicit intentions regarding conservation of native habitat or strengthening open space character roles.

Additionally there are areas of natural bushland or open space, which are not contained within such zoning controls. Having regard to the application of the principles of sustainable development as outlined as State objectives for land use planning in the Land Use Planning and Approvals Act 1993, it is necessary to review the current Scheme provisions with a view to enabling cleared direction and ensuring protection to areas of natural and cultural significance." (Hobart Open Space Study- (Chapman, 1997, p. 6)

In the Review (Chapman 1997)- The Hobart Open Space Study- the following general recommendations where made;

- Increased protection and conservation of ecological values such as fauna and flora, and the identification of Natural Value Conservation Areas.
- Increased protection and conservation of Cultural Values, including;
  Scenic Landscapes
  Cultural Landscapes
  Landscape settings
  Historical Values or Associations
  Social value
  Recreational Value

It details a list of procedures for an evaluation process of subdivision applications, highlighting amongst other things, open space design (p. 45). The specific acquisition program (p. 50) includes sections of the Sandy Bay Rivulet. These are listed as category 3; Favored for direct acquisition or open space contribution (within an immediate program at an available opportunity).

Tasmanian State Government Involvement

Within Tasmania the trend and demand for urban recreation has been recognized by the State Government, with a state wide strategy to help document and improve tracks and trails. At present the Minister for Community Development is conducting community forums and email surveys through; www.development.tas.gov.au/sportrec/trails.html.

This strategy will now doubt lead to a state 'parks and recreation 'policy as applied to urban development through amendments to local council planning schemes. Unless this action is direct, the necessary changes will not occur and notions of sustainability and increased urban recreation will remain inscribed in principle, yet accepted only in part and adopted sporadically in local land management practices.

Federal Involvement

Federal funding is now being utilized to expand Hobart's open space network. Of note recently, is the acquisition of Porters Hill, adjacent to the existing Mt. Nelson Skyline Reserve.

5.4 Environmental Best Practice Guidelines for managing riparian vegetation

In 2003, the Department of Primary Industries, Water and Environment, released the Waterways & Wetlands Works Manual. Included within is the Environmental Best Practice Guidelines for managing riparian vegetation, containing the following headings and relevant information;

"*1. What is a riparian zone*
2. Importance of riparian vegetation
3. Threats to riparian zones
4. Environmental management principles
Preserve remnant vegetation
Seek expert advice
Fence off riparian zone
Buffer width should reflect the management objectives

The width of a riparian buffer zone will be determined by the management objectives for the area and the site characteristics. The zone should be wide enough to achieve the management objectives for the area. The site characteristics that should be considered include slope, soil texture and erodibility, drainage area, bank height, adjacent land use and existing vegetation. The large number of factors to be considered means that, although setting 'generic' widths for riparian zones at a regional or state level offers some protection for waterways, a detailed analysis is needed to determine the most appropriate width. For example, the publications Guidelines for Stabilizing Streambanks with Riparian Vegetation (Abernethy & Rutherford, 1999) (see 'Section 6. References') describes a method for determining the width needed for a buffer zone designed to stabilise the banks. Ideally, a riparian zone should be as large as possible. This will maximise the benefits of the riparian vegetation and minimise the effects of the adjacent land use on the waterway.
Stabilise the channel
Use native species
Remove weeds
Preserve small and large waterways
5. Riparian clearance controls

Local government
Planning schemes vary as to whether a permit is required to remove riparian vegetation on private and Crown land. In those municipalities where a permit is required, variations exist as to what land use activities are considered exempt.
Some recent planning Schemes incorporate a Wetland and Waterways Schedule, which specifies the objectives and standards for development in or near waterways. While the details of the Schedule vary between planning schemes, they typically cover general works, road construction, water quality protection, and riparian vegetation clearance (see generic example in box).
A key objective of the schedule is to maintain riparian vegetation....., removing vegetation is generally prohibited within a set distance of the outer boundary of a stream boundary of a stream bank of a waterway or a wetland. Removing vegetation within this distance may be approved if it can be demonstrated that the performance criteria have been met."

Issue: Riparian vegetation
Objective
To maintain riparian vegetation as a natural filter for nutrients and soluble pollutants, and to prevent erosion and increased sediment flows.
Acceptable solution
a) No vegetation si to be removed in or within 30 metres of; *i) permanent wetland* *ii) a waterway* *iii) a shoreline or estuary.* *b) No filling, draining or alteration of the water level of a naturally occurring waterway or wetland is allowed.*
Performance Criteria
a) If it is proposed to remove vegetation in or within 30 meters of the boundary of a waterway or wetland, applications should demonstrate through a plan of management how *i) the capacity of the remaining vegetation to act as a natural filter fro nutrients and soluble pollutants will not be adversely affected* *ii) increased sediment flows will be prevented* *iii) biological diversity will be maintained* *iv) weeds will be removed in accordance with best practice environmental management principles.* *b) Any development or works affecting the water level of any naturally occurring waterway or wetland must not adversely affect natural flows and there is to be no increase in erosion or sedimentation as a result of the development or works.*

Table 4. (Waterways & Wetlands Works Manual 2003. No.7 Environmental Best Practice Guidelines: Managing Riparian Vegetation. p. 4)

Other controls

Clearing riparian vegetation can trigger a number of other legislative requirements

- *Environmental Management and Pollution Control Act 1994*
- *Crown Lands Act 1976*
- *National Parks and Wildlife Act 1970*
- *Threatened Species Protection Act 1995*
- *Environmental Protection and Biodiversity Conservation Act 1999*
- *Aboriginal Relics Act 1975*
- *Agricultural and Veterinary Chemicals (Control of Use) Act 1995.*

These statutory requirements are outlined in the Environmental Best Practice Guidelines 1. Legislative and Policy Requirements for Protecting Waterways and Wetlands when undertaking Works. The relevant government agencies should be contacted for further advice.

6. References"

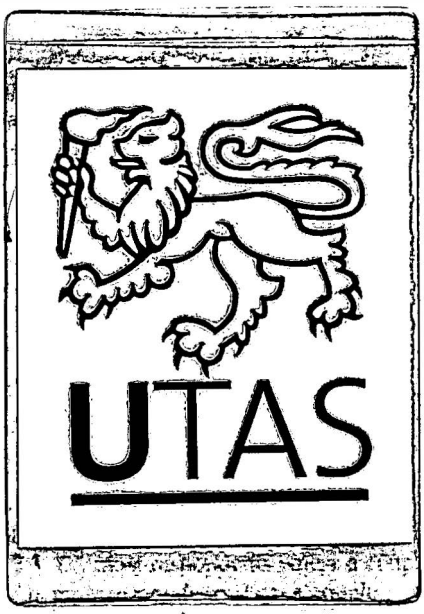
5.4.1 Guidelines for Stabilizing Stream Banks with Riparian Vegetation (Abernethy & Rutherford, 1999)

This is the primary reference in the previously described (4.6) Waterways and Wetlands manual: Environmental Best Practice Guidelines for managing riparian vegetation. These guidelines **(Abernethy & Rutherford, 1999)** provide techniques to help specify the width and composition of vegetated riparian zones, for bank erosion control. They are produced by the Cooperative Research Centre for Catchment Hydrology at Department of Geography and Environmental Studies, University of Melbourne. Being a scientific paper, the techniques and information is quite technical and academic in nature, and may not be readily accessible or understood by the lay person. Essentially the method prescribes;

riparian width (m) = Basic allowance (5m) + bank height allowance (m)+ vegetation condition and an establishment allowance (up to 25 years).

5.4.2 National Riparian Lands Research & Development Program

Established by Land and Water Australia in 1993, the program influences priorities for improving riparian management. It recent produced a Legacy CD-ROM outlining key findings. As part of its communication strategy, it brings together all of the research, fact sheets, technical and practical guides, tools and key scientific references from 13 years of work into one, easy to access product. Additional information is the design guide for reintroducing wood into Australian streams. The CD package does seem to be directed towards the rural sector.



CHAPTER 6: RESULTS

The following chapter gives an analysis of the community survey results. The second half of the chapter contains extracts of comments.

Community survey

Of the 260 community survey's letter dropped, 200 were directly on the Sandy Bay Rivulet (SBR) and proposed track (group's A, B and C), while the other 60 were neighbouring but not directly bordering the proposed park (group D). A total of 72 responses were received and analysed, giving an overall response rate of 28%.

To help clarify the results; the data set was split into the following four groups:
Group A: Bordering the SBR and proposed track, and in-favour of the park.
Group B: Bordering the SBR and proposed track, and unsure of the park.
Group C: Bordering the SBR and proposed track, and not-in-favour of the park.
Group D: Not bordering the SBR and proposed track, and in favour of the park.
There were no response's which did not border the SBR and were not-in-favour of the park.

For convenience, the survey questions were split into seven sub-groups;

- 6.1 Demographics of Respondents: Question 27-31
- 6.2 Location and Response: Questions 1 and 2
- 6.3 General management: Questions 3-6
- 6.4 Sandy Bay Rivulet management: Questions 7-20
- 6.5 Open space Land: Questions 21-24 & 26
- 6.6 Property Values: Question 25
- 6.7 Comments

6.1. Demographics of Respondents: Questions 27-31

Q. 27) Gender of respondent

Of the 72 replies there were 39 female, 28 male and 5 respondents who answered as a couple.
(Where 1=male, and 2=female)
Group A had a mean value of 1.55
Group B had a mean value of 1.60
Group C had a mean value of 1.67
Group D had a mean value of 1.75

28) Type of household

f the 72 respondents, the type of household was described as follows; there were 18 singles, 22
couples, 27 families and 5 share-houses.
(Where; 1=Single, 2=Couple, 3=Family, 4=Share-house)
The mean community response is 2.3, i.e. most respondents where a couple.
Group A had a mean value of 2.4, i.e. most respondents were a couple.
Group B had a mean value of 1.8, i.e. most respondents were a couple.
Group C had a mean value of 1.5, i.e. most respondents were a either a couple or single.
Group D had a mean value of 2.3, i.e. most respondents were a couple.

29) Number of children in the house.

Of the 72 respondents; 15 had one child, 11 had two children, 2 had three children, and one had four children. Thus giving a total of 47 children and an average response was 0.7 children per residence.
Group A had a mean value of 0.8, i.e. most respondents had a child in the house.
Group B had a mean value of 0.0, i.e. none of the respondents have any children in the house.
Group C had a mean value of 0.3, i.e. most respondents didn't have any children in the house.
Group D had a mean value of 0.6, i.e. most respondents had a child in the house.

30) Are you the owner?

Of the 72 respondents, 59 owned their own homes, while 13 did not.
(Where 1=yes and 2=No)
The mean community response is 1.2, i.e. most respondents own their house.
Group A had a mean value of 1.2, i.e. most respondents own their house.
Group B has a mean value of 1.0, i.e. all of the respondents own their house.
Group C had a mean value of 1.0, i.e. all of the respondents own their house.
Group D had a mean value of 1.2, i.e. most respondents own their house.

31) How long have you lived at this residence?

Of the 72 respondents the average period of residence was 8 and a half years.
Group A had a mean value of 7.7, i.e. most respondents have been residents for approximately 8 years.
Group B has a mean value of 10.6, i.e. most respondents have been residents for approximately ten and a half years.
Group C has a mean value of 7.4, i.e. most respondents have been residents for approximately 7 and a half years.
Group D has a mean value of 9.7, i.e. most respondents have been residents for approximately 9 and a half years.

32) Age class

Of the 72 respondents; 15 were under 30 years old,
26 between 31 and 45,
21 between 46 and 60, and
10 where over 60.
Where class; 1= under 30, 2= 30-45, 3= 46-60, 4= over 60
The mean community response was 2.4, putting the average respondent in the 30-45 age bracket.
Group A had a mean value of 2.2, i.e. most respondents are in the 30-45 age bracket
Group B has a mean value of 3.0, i.e. most respondents are in the 46-60 age bracket.
Group C has a mean value of 2.8, i.e. most respondents are in the upper half (approximately) of the 46-60 age bracket.
Group D has a mean value of 2.4, i.e. most respondents are in the 30-45 age bracket.

33) Community group participation: Are you or have you been an active member of any community groups?

Of the 72 respondents, approximately one in three respondents is in a community group of some description. The average response is 0.3, i.e. most respondents are not in any community group or organization. There were 14 respondents who belonged to one group, 3 who were in 2 groups, and one respondent who was in 3 groups.

Group A had a mean value of 0.4, i.e. approximately 40% of respondents are in a community group. (This group has the highest value)
Group B had a mean value of 0.2, i.e. approximately 20% or one in five of respondents are in a community group.
Group C had a mean value of 0.2, i.e. approximately 20% or one in five of respondents are in a community group.
Group D had a mean value of 0.2, i.e. approximately 20% or one in five of respondents are in a community group.

6.2 Location and Response: Questions 1 and 2

Q. 1) Does your property directly border the Sandy Bay Rivulet or the proposed track?

200 surveys went to directly bordering properties and 60 went to non -bordering properties. The respondents directly on the SBR and proposed track (groups A, B & C) had a 26% return rate (52 from 200), while the other non-neighbouring replies (group C) had 33 % return rate (20 from 60). Of the total of 72 replies; almost three quarters (72%) of respondents live directly on the SBR or the proposed track (groups A, B & C), and one fifth (28%) of respondents did not live directly on the SBR or the proposed track (group D).

Q. 2) Are you in favour of establishing a Sandy Bay Rivulet i.e. a streamside reserve that is accessible to the public along the proposed track?

Of the total of 72 replies; Four fifths (84%) of respondents were in favour of the proposed track. Less than one tenth (8%) of respondents were not in favour of the proposed park/track. Similarly, less than one tenth (7%) of respondents were unsure of the proposed park/track. To help clarify the results; a data set was constructed by combining questions 1 and 2, and split into the previously mentioned four groups (Figure 8):

Group A: Bordering the SBR and proposed track, and in-favour (41 respondents or 56.9%).
Group B: Bordering the SBR and proposed track, and unsure (5 respondents or 6.9%).
Group C: Bordering the SBR and proposed track, and not-in-favour (6 respondents or 8.3%).
Group D: Not bordering the SBR and proposed track, and in favour (20 respondents (all in-favour) or 27.8%).
There were no response's which did not border the SBR and were not-in-favour of the park.

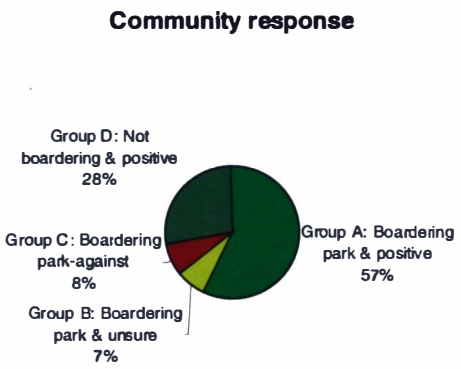


Figure 8. Proportion of respondents as a function of question 1 - proximity to rivulet, and response to question 2- opinion towards the proposed SBR linear park.

Questions 3-24, & 26

The following questions were rated on a five point scale from 1 (strongly disagree) to 5 (strongly agree) as shown below in Figure 9. Mean ratings on these questions were calculated for each of the four groups.

1----------2----------3----------4----------5
Strongly Disagree Disagree Undecided Agree Strongly Agree

Figure 9. Five point rating scale

6.3 General management: Questions 3-6

Q. 3) You use or value neighborhood bush/rivulet reserves and walking tracks, e.g. the Hobart Rivulet Linear Park.

Of the 72 respondents, the average community response was 4.4, i.e. Agree to using or valuing neighborhood bush/rivulet reserves and walking tracks, e.g. the Hobart Rivulet Linear Park.
Group A had a mean value of 4.4, i.e. Agree.
Group B had a mean value of 4.2, i.e. Agree.
Group C the lowest mean value of 3.0, i.e. Undecided, and has the greatest deviation from the average value.
Group D had the highest mean value of 4.9, i.e. Strongly Agree.

Q. 4) You would like greater community involvement, e.g. consultation, information gathering and sharing, clean-up days to encourage private landowners to manage their land in accordance with management plans.

Of the 72 respondents, the average community response was 3.9, i.e. Agree to greater community involvement, e.g. consultation, information gathering and sharing, clean-up days to encourage private landowners to manage their land in accordance with management plans.

Group A had a mean value of 4.2, i.e. Agree.
Group B had a mean value of 3.4, i.e. Undecided.
Group C had the lowest mean value of 2.3, i.e. Disagree, and has the greatest deviation from the average value.
Group D had the highest mean value of 4.4, i.e. Agree

Q. 5) There should be more community walkways and open space planning networks, such as ocean, streamside and skyline recreation parks.

Of the 71 respondents, the average community response was 4.2, i.e. Agree to more community walkways and open space planning networks, such as ocean, streamside and skyline recreation parks.

Group A had a mean value of 4.3, i.e. Agree.
Group B had a mean value of 3.4, i.e. Undecided.
Group C had the lowest mean value of 2.0, i.e. Disagree, and has the greatest deviation from the average value.
Group D had the highest mean value of 4.8, i.e. Strongly Agree.

Q. 6) At the Waterworks Quarry, in addition to encouraging rock-climbing, provide passive recreation features such as a native garden, path and benches.

Of the 72 respondents, the average community response is 4.0, i.e. Agree that at the Waterworks Quarry, in addition to encouraging rock-climbing, provide passive recreation features such as a native garden, path and benches.

Group A had a mean value of 3.9, i.e. Agree.
Group B had a mean value of 3.8, i.e. Agree.
Group C had the lowest mean value of 2.5, i.e. Disagree / Undecided, and has the greatest deviation from the average value.
Group D has the highest mean value of 4.5, i.e. Agree / Strongly Agree.

6.4 Sandy Bay Rivulet management: Questions 7-20

Q. 7) You are in favour of restoring the streamside zone with native species.

Of the 71 respondents, the average community The average community response is 4.2, i.e. Agree to restoring the streamside zone with native species.

Group A had a mean value of 4.4, i.e. Agree.
Group B had the lowest mean value of 2.8, i.e. Undecided, and has the greatest deviation from the average value.
Group C had a mean value of 3.0, i.e. Undecided,.
Group D had the highest mean value of 4.8, i.e. Strongly Agree.

Q. 8) You are in favour of gradual willow removal to improve water flow.

Of the 72 respondents, the average community The average community response is 4.0, i.e. Agree to gradual willow removal to improve water flow.

Group A had a mean value of 4.2, i.e. Agree.
Group B had a mean value of 2.6, i.e. Agree.
Group C had the lowest mean value of 2.3, i.e. Disagree, and has the greatest deviation from the average value.
Group D had the highest mean value of 4.7, i.e. Strongly Agree.

Q. 9) You are in favour of leaving it as is, with no park or walk/cycle track.

Of the 72 respondents, the average community response is 2.5, i.e. Undecided / Disagree to leaving it as is, with no park or walk/cycle track.

Group A had a mean value of 2.0, i.e. Disagree.
Group B had a mean value of 3.8, i.e. Agree.
Group C had the highest mean value of 5.0, i.e. Strongly Agree, and has the greatest deviation from the average value.
Group D had the lowest mean value of 1.7, i.e. Disagree.

Q. 10) You are in favour of using the rivulet as a natural park rather than primarily for walking access to other places.

Of the 72 respondents, the average community response is 3.0, i.e. Undecided to using the rivulet as a natural park rather than primarily for walking access to other places.

Group A had a mean value of 3.0, i.e. Undecided.
Group B had the highest mean value of 4.4, i.e. Agree, and has the greatest deviation from the average value.
Group C had a mean value of 3.8, i.e. Agree.
Group D had the lowest mean value of 2.4, i.e. Disagree.

Q. 11) You are in favour of the creation of a Sandy Bay-Rivulet Park and extension of the pipeline track walkway/cycle track from Romilly Street down into Fitzroy Gardens.

Of the 72 respondents, the average community response is 4.2, i.e. Agree to the creation of a Sandy Bay Rivulet Park and extension of the pipeline track walkway/cycle track from Romilly Street down into Fitzroy Gardens.

Group A had a mean value of 4.4, i.e. Agree.
Group B had a mean value of 3.2, i.e. Undecided.
Group C had the lowest mean value of 2.0, i.e. Disagree, and has the greatest deviation from the average value.
Group D had the highest mean value of 4.7, i.e. Strongly Agree.

Q. 12) You are in favour of continuing to lobby to extend the proposed park beyond Parliament Street and on to Regent Street.

Of the 71 respondents, the average community response is 3.6, i.e. Agree to You are in favour of continuing to lobby to extend the proposed park beyond Parliament Street and on to Regent Street.

Group A had a mean value of 4.0, i.e. Agree.
Group B had a mean value of 2.4, i.e. Disagree.
Group C had the lowest mean value of 1.2, i.e. Strongly Disagree, and has the greatest deviation from the average value.
Group D had the highest mean value of 3.9, i.e. Agree.

Q. 13) You are in favour of upgrading the existing informal track for walkers.

Of the 68 respondents, the average community response is 4.0, i.e. Agree to upgrading the existing informal track for walkers.

Group A had a mean value of 4.4, i.e. Agree.
Group B had a mean value of 3.2, i.e. Undecided.
Group C had the lowest mean value of 1.4, i.e. Strongly Disagree, and has the greatest deviation from the average value.
Group D had the highest mean value of 4.1, i.e. Agree.

Q. 14) You are in favour of upgrading the existing informal track to a cycle, wheel chair and pram accessible standard, where feasible.

Of the 67 respondents, the average community response is 3.7, i.e. Agree to upgrading the existing informal track to a cycle, wheel chair and pram accessible standard, where feasible.

Group A had a mean value of 3.9, i.e. Agree.
Group B had a mean value of 3.0, i.e. Undecided.
Group C had the lowest mean value of 1.4, i.e. Strongly Disagree, and has the greatest deviation from the average value.
Group D had the highest mean value of 4.3, i.e. Agree.

Q. 15) You are in favour of Seek funding/subsidies for fencing and gates for affected residents.

Of the 68 respondents, the average community response is 4.0, i.e. Agree to seek funding/subsidies for fencing and gates for affected residents.

Group A had a mean value of 4.1, i.e. Agree.
Group B had a mean value of 3.2, i.e. Undecided.
Group C has the lowest mean value of 2.2, i.e. Disagree, and has the greatest deviation from the average value.
Group D had the highest mean value of 4.3, i.e. Agree.

Q. 16) You are in favour of strengthening Neighbourhood Watch along the Sandy Bay Rivulet.

Of the 68 respondents, the average community response is 4.1, i.e. Agree to strengthening Neighbourhood Watch along the Sandy Bay Rivulet.

Group A had a mean value of 4.1, i.e. Agree.
Group B had the highest mean value of 4.4, i.e. Agree.
Group C had the lowest mean value of 2.6, i.e. Undecided, and has the greatest deviation from the average value.
Group D had a mean value of 4.3, i.e. Agree.

Q. 17) You are in favour of more murals, such as the one under Lynton Avenue underpass.

Of the 67 respondents, the average community response is 3.3, i.e. Undecided to more murals, such as the one under Lynton Avenue underpass.

Group A had the lowest mean value of 3.2, i.e. Undecided.
Group B had a mean value of 3.4, i.e. Undecided.
Group C has the highest mean value of 3.6, i.e. Agree, and has the greatest deviation from the average value.
Group D had a mean value of 3.4, i.e. Undecided.

Q. 18) You are in favour of re-creating a community orchard/garden, reflecting the area's history of orchards and market gardens.

Of the 67 respondents, the average community response is 3.6, i.e. Agree to re-creating a community orchard/garden, reflecting the area's history of orchards and market gardens.

Group A had a mean value of 3.7, i.e. Agree.
Group B had the highest mean value of 3.8, i.e. Agree.
Group C had the lowest mean value of 3.0, i.e. Undecided, and has the greatest deviation from the average value.
Group D had a mean value of 3.7, i.e. Agree.

Q.19) You are in favour of maintaining the tree sky-line.

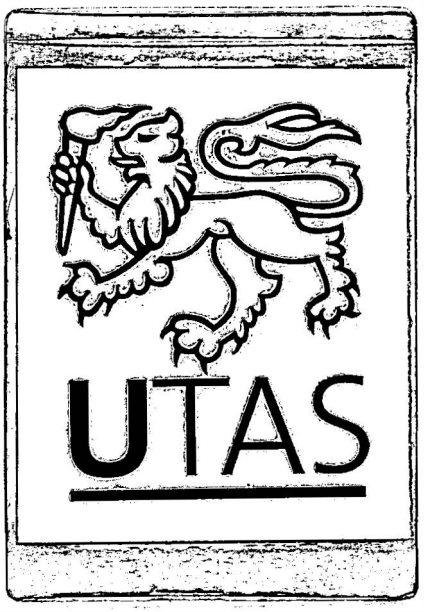
Of the 69 respondents, the average community response is 4.4, i.e. Agree to maintaining the tree sky-line.

Group A had a mean value of 4.4, i.e. Agree.
Group B had a mean value of 4.6, i.e. Strongly Agree.
Group C had the lowest mean value of 4.2, i.e. Agree, and has the greatest deviation from the average value.
Group D had a mean value of 4.6, i.e. Strongly Agree.

Q. 20) You are in favour of interpretation panels on local history and natural interests.

Of the 68 respondents, the average community response is 3.9, i.e. Agree to interpretation panels on local history and natural interests.

Group A had the highest mean value of 4.0, i.e. Agree.
Group B had a value of 3.6, i.e. Agree.
Group C has the lowest value of 3.2, i.e. Undecided, and has the greatest deviation from the average value.
Group D had a mean value of 3.9, i.e. Agree.



6.5 Open space Land: Questions 21-24 & 26

For links or access-ways along waterways and other potential open-space networks, should council;

Q. 21) Compulsorily acquire access.

Of the 68 respondents, the average community response is 3.1, i.e. Undecided to compulsorily acquire access.
Group A had a mean value of 3.4, i.e. Undecided.
Group B had a mean value of 2.0, i.e. Disagree.
Group C had the lowest mean value of 1.7, i.e. Disagree, and has the greatest deviation from the average value.
Group D had a mean value of 3.4, i.e. Undecided.

Q. 22) Provide suitable compensation if land is compulsory acquired.

Of the 66 respondents, the average community response is 4.1, i.e. Agree to Provide suitable compensation if land is compulsory acquired.

Group A had a mean value of 4.2, i.e. Agree.
Group B had a mean value of 4.2, i.e. Agree.
Group C has the lowest mean value of 3.0, i.e. Undecided, and has the greatest deviation from the average value.
Group D had a mean value of 4.2, i.e. Undecided.

Q. 23) Favor voluntary agreements, partnerships and covenants for riverside and other easements.

Of the 67 respondents, the average community response is 3.6, i.e. Agree to favor voluntary agreements, partnerships and covenants for riverside and other easements.

Group A had a mean value of 3.6, i.e. Agree.
Group B had a mean value of 2.6, i.e. Undecided, and has the greatest deviation from the average value.
Group C had the mean value of 3.3, i.e. Undecided,
Group D had the highest mean value of 3.8, i.e. Agree.

Q. 24) Decrease the landowner rates and taxes proportionately if the streamside strip has shared access and management. e. g. Higher rebates for more permanent covenants, and lower rebates for less binding agreements/partnerships.

Of the 65 respondents, the average community response was 3.3, i.e. Undecided to decrease the landowner rates and taxes proportionately if the streamside strip has shared access and management. e. g. Higher rebates for more permanent covenants, and lower rebates for less binding agreements/partnerships.

Group A had the lowest mean value of 3.2, i.e. Undecided.
Group B had a mean value of 3.4, i.e. Undecided.
Group C had the highest mean value of 3.6, i.e. Agree, and has the greatest deviation from the average value.
Group D had a mean value of 3.4, i.e. Undecided.

Q. 26) I feel adequately informed and included in the planning process.

Of the 71 respondents, the average community response was 3.3, i.e. Undecided to feeling adequately informed and included in the planning process.

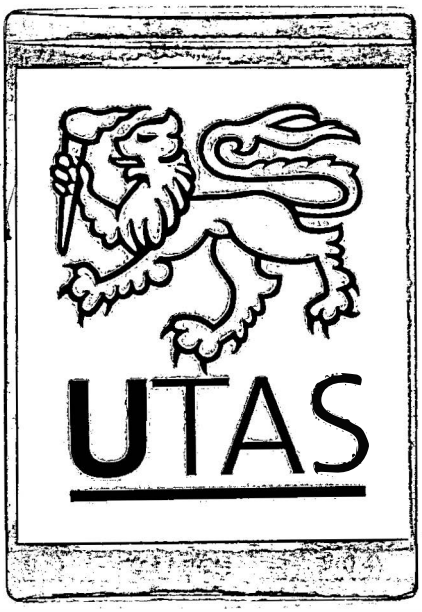
Group A had the lowest mean value of 3.2, i.e. Undecided.
Group B had a value of 3.4, i.e. Undecided.
Group C had the highest mean value of 3.6, i.e. Agree, and has the greatest deviation from the average value.
Group D had a mean value of 3.4, i.e. Undecided.

6.6 Property Values: Question 25

Q. 25) What do you think neighbourhood property prices would do if the Sandy Bay Rivulet Park went ahead?

Of the 67 respondents completing this question; 11 indicated they thought there would be a decrease in neighbourhood property prices, 24 indicated an increase, 31 indicating that prices would be unaffected, and one respondent indicated that adjoining values would decrease, while generally neighbourhood property values would increase.

Where 1=Decrease, 2=Unaffected & 3=Increase
The average community response was 2.2, i.e. a slight increase in property values.
Group A had a mean value of 2.3, i.e. a slight increase.
Group B had a mean value of 1.4, i.e. a decrease.
Group C had the lowset mean value of 1.2, i.e. a stronger decrease, and has the greatest deviation from the average value.
Group D had the highest mean value of 2.5, i.e. an increase.



Summary: Results Tables

Table 3 Mean ratings of each group for each question (Standard Deviations in brackets)

Question	Group A	Group B	Group C	Group D	Average
3	4.36 (1.2)	4.20 (0.8)	3.00 (1.4)	4.85 (0.4)	4.38 (1.1)
4	4.18 (0.9)	3.40 (1.3)	2.33 (1.5)	4.35 (0.7)	3.90 (1.2)
5	4.27 (1.2)	3.40 (1.5)	2.00 (1.0)	4.80 (0.4)	4.15 (1.3)
6	3.91 (1.2)	3.80 (0.8)	2.50 (1.4)	4.50 (0.7)	3.98 (1.2)
7	4.36 (1.2)	2.75 (1.5)	3.00 (1.9)	4.80 (0.4)	4.22 (1.3)
8	4.18 (1.3)	2.60 (1.8)	2.33 (2.1)	4.65 (0.5)	3.95 (1.5)
9	2.00 (1.2)	3.80 (1.3)	5.00 (0)	1.65 (0.7)	2.48 (1.5)
10	3.18 (1.2)	4.40 (0.9)	3.83 (1.6)	2.40 (0.8)	3.05 (1.2)
11	4.36 (0.7)	3.20 (1.1)	2.00 (1.7)	4.70 (0.5)	4.05 (1.3)
12	4.09 (1.0)	2.40 (1.3)	1.20 (0.5)	3.90 (1.0)	3.44 (1.8)
13	4.20 (0.6)	3.20 (0.8)	1.40 (0.9)	4.05 (0.8)	3.64 (1.2)
14	3.70 (1.2)	3.00 (0.7)	1.40 (0.9)	4.32 (0.7)	3.62 (1.3)
15	3.70 (1.3)	3.20 (2.1)	2.20 (1.6)	4.32 (0.5)	3.74 (1.3)
16	3.90 (0.9)	4.40 (0.5)	2.60 (1.3)	4.26 (0.7)	3.97 (1.0)
17	3.10 (1.5)	3.40 (1.1)	3.60 (1.5)	3.39 (1.0)	3.34 (1.7)
18	3.50 (1.3)	3.80 (0.8)	3.00 (1.6)	3.67 (1.0)	3.55 (1.1)
19	4.40 (1.3)	4.60 (0.9)	4.17 (1.6)	4.58 (0.6)	4.48 (1.0)
20	3.70 (1.3)	3.60 (0.9)	3.20 (1.3)	3.95 (0.9)	3.74 (1.0)
21	3.70 (1.0)	2.00 (1.4)	1.67 (1.6)	3.42 (1.0)	3.05 (1.3)
22	4.10 (1.3)	4.20 (1.8)	3.00 (2.3)	4.16 (0.9)	4.03 (1.3)
23	3.90 (1.3)	2.60 (0.9)	3.33 (1.9)	3.83 (0.9)	3.62 (1.2)
24	3.20 (1.7)	3.20 (1.5)	2.75 (2.1)	3.61 (1.0)	3.35 (1.4)
26	3.00 (1.1)	3.00 (0.7)	2.33 (1.8)	3.70 (0.9)	3.24 (1.1)

Table 4 Demographics and Property Values: Mean scores of each group for each question (Standard Deviations in brackets).

Question	Group A	Group B	Group C	Group D	Average
25	2.3	1.4	1.2	2.5	2.2
27	1.55 (0.7)	1.60 (0.7)	1.67 (0.5)	1.75 (0.6)	1.67 (0.6)
28	2.64 (0.9)	1.80 (0.5)	1.50 (0.8)	2.25 (1.0)	2.19 (1.0)
29	1.45 (1.4)	0.00 (0)	0.33 (0.5)	0.60 (0.9)	0.71 (1.0)
30	1.18 (0.4)	1.00 (0.0)	1.0 (0.0)	1.15 (0.4)	1.12 (0.3)
31	7.73 (6.7)	10.60 (14.4)	7.39 (8.8)	9.70 (10.7)	8.96 (9.7)
32	2.36 (1.0)	2.0 (1.0)	2.83 (0.8)	2.40 (1.1)	2.55 (1.0)
33	0.82 (0.8)	0.20 (0.5)	0.17 (0.4)	0.5 (0.4)	0.33 (0.6)

6.7 Comments

Comments received at the end of the community survey where like wise grouped either A B, C or D.

Group A: Bordering the SBR and proposed track, and in-favour (41 respondents or 56.9%).

"In general I am in favour of developing the SBR track for recreational purposes etc. However, I strongly disagree with forcing private residents to surrender their land (compensation or not). We are after all a democracy and civilized country." R2

"Walkway – Bring it on." R3

h *"Open space networks should be done before 'Tin Shed Alley' built over rivulet near Lynton Avenue. Protect the sky-line from Tolman's Hill 'McMansions'.*

To control erosion, upgrade the existing track, but do not pave, widen or seal.

Cycling and pedestrian tracks do not mix – especially when the track is downhill. The cyclists speed intimidates pedestrians and cyclists often cannot stop in time. Cyclists already cause safety problems on mountain tracks, and greatly increase track erosion.

"Dog –on lead only (many owners cannot control dogs behaviour)." R4

"Security appears to be the most important issue." R7

"As a new resident and with an active 2 year old I very much appreciate the walking tracks an and around Hobart. They are a good alternative to playgrounds and an opportunity to introduce my son to walking, wildlife, etc." R9

"Management is necessary. Any land adjacent to the linear park and public access track should not be permitted subdivision or development approval. HCC should acquire the available open spaces for inclusion and expansion of the linear park. Developments encroaching on available open space will decrease public amenity of the track and linear park. It may also increase security and privacy issues associated with free public access. An example – the unit development at the bottom of Waterworks Road. This as a public open space would have held more value for public good than stratum titled units and town houses, that the linear park must now negotiate. Our family strongly supports this proposal and is happy to assist in any way possible to achieve the outcome." R10

"Compensation should be limited, based on my belief that owners of creek banks and beds have an obligation to maintain them but do not. Therefore public ownership would relieve them of this obligation. Private ownership of creeks and rivulets is not on the public interest as they are storm-water paths and are not maintained appropriately. Get rid of crack willows! The native trees will grow back quick enough!" R11

"Where track borders on properties appropriate security measures (fences, etc.) should be put in place." R13

"We enjoy the informal-ness of the quarry. Would not like to see it too formalized. We were disappointed that so many native trees were removed to construct the fence." R17

"A sustainable community friendly and native restoration would be acceptable – open to all and accessible by all. Care should be taken to respect landowners privacy and noise protection from the outlet." R18

"Not in favour of felling trees (willows) if it exposes my house to public. Council to supply (free-of-charge) electric dog collars to dog owners on affected route." R 22

"Bicycle paths through Fitzroy Gardens is a ridiculous idea." R23

"Noisy roosters in valley a real problem at Stoney Steps! Great to keep reducing smoke fires in valley. You should speak to Waterworks Valley Sustainability Group." R29

"We encourage and support the development of the Sandy bay Rivulet Linear Park as a means of returning the rivulet to a managed waterway. It is hoped that a defined track will also eliminate the occurrence of members of the public walking through private property as there is currently no fencing or markings on the property boundaries. Many people use the informal track along the rivulet and cut up through our property and others to gain access to streets such as Kooyong Glen and Romilly Street." R 32

"I think the whole idea is very worthwhile. As I am 88 years old, perhaps I will not be around to see it all happening." R37

"The rivulet environs are prone to flood, and future planning must direct development so as to decrease insurance liability – Gradual retracting of the built environment, save low impact recreation (e.g. foot paths)." R41

"Yes, as I believe the community has access to such things (i.e. walkway from Battery Point to Sandy Bay etc.) But from a property owners point of view, no, due to security issues (and behavioural), that Council and police seem to do nothing about." R41

Group B: Bordering the SBR and proposed track, and unsure (5 respondents or 6.9%).

"Main concerns;

1) Parking saturated areas, e.g. city commuters parking in the rivulet connecting streets (already experiencing parking problems) and using rivulet walkway to continue on foot.

2) Security – Householders with property boundaries directly exposed to walk track. The anticipated increase in use of the track may or may not be for legitimate reasons

3) Existing trees and all the vegetation help provide sight/sound barrier from Southern Outlet traffic and reduction would have adverse impact on this problem for affected householders." R2

"Living opposite the Parliament Street oval and Fitzroy Gardens gives one a completely different look at the situation than those only visiting it occasionally.

The creek called the Wellington Rivulet is a wonderful natural resource for children and families to explore in the inner city. Please do not spoil it?

The Parliament Street oval and big slide is a happy and enjoyable place for families to play, picnic and exercise the family dog. Come nightfall it turns into a nightmare for those who live on the boundaries. In summer it is not unusual fro me to ring the police once or twice a week as people coming from the pubs and parties decide to yahoo, yell at the top of their voices and swear as they ride the slide and drink anywhere from 9:30 pm to 4 or 5 am.

This is the down side of the facilities in this area. Who picks up the broken glass and needles the next day? The HCC is a very good at clearing the area. If it has been a particularly bad night and there is a lot of glass I often go and do it myself.

No, I do not want a walking track past my back door. The area attracts enough no hopers. Let's not encourage more. Before the installation of the big slide the nights were peaceful. Now the area attracts druggies and drunks.

I have been burgled and had my house trashed as many as nine times. All the houses in Digney Street have been burgled at some time. The police say it is an easy get-away as they don't have to go into the street and be seen. They make their getaway down the rivulet and across the oval." R4

"Only down to Parliament Street, Fitzroy Gardens. The Council Consultant seems to have a good balance." R5

Group C: Bordering the Sandy Bay Rivulet and proposed track, and not-in-favour (6 respondents or 8.3%).

"I have grave reservations about messing with nature. The rivulet is a major asset to Hobart, adding built infrastructure and more people and machines would result in denuding the natural beauty of the place. Apparently removing the willows would cause the banks of the stream to collapse. Why not consider an upgrade of a scummy area to a park or native garden, or community garden in a part of Hobart where the people could benefit e.g. industrially based suburbs. I found the questions difficult to answer due to their loaded nature-see question 3." R2

"No consideration given to property privacy, security and value...called trespassing! Absolutely not! These are the reasons why we bought in the first instance.

Try asking;

1) *How many walkways are therefore the population?*
2) *Where do they walk and how often?*
3) *What wrong with existing ones?*
4) *Would you like the public in your backyard?*

I've already paid a high mortgage and rates to live here! Why don't the public leave our backyard alone! I'm sick and tired of others 'high jacking' our property. Why don't they offer theirs or buy near the rivulet?

1) *We didn't go into huge financial debt just to others can take it away!*
2) *Why don't those who suggest this walkway give up their property for the public to trample on!*
3) *I constantly pick up litter left by the public. This would get worse with a walkway*
4) *We have voiced this opinion for the last 2 months to: Council, friends of Sandy Bay Rivulet, the Mercury and are tired and stressed of repeating this."* R3

"I understand that European trees (such as those in the Fitroy Gardens), the poplars and willows are not suited to the Australian environment. Nevertheless, that are well maintained and very beautiful and unusual feature of the landscape.

The poplars and willows were the reason we purchased here. Leave existing trees alone. There will be a lack of privacy and safety. No thank you!

My personal concern on the walking track concerns the fact that the neighbourhood parks attract a lot of anti-social behaviour at night. I am currently going to considerable expense to make my home secure from the street. I do not want to have my peace threatened by anti-social behaviour on a walking track at the very open rear of my home.

I have no objections to walkers, bikers, prams and wheelchairs using a tack in daylight." R4

"This is a very noisy road (the Southern outlet). Also opening this area, would encourage improper use e.g. drunken behaviour on weekends. The rear of properties would be open to burglars." R5

"Too many fallen rocks and youngster throwing rocks off the top of the quarry. Leave it as it is other than remove the weeds. The pipeline is already sufficient.

Tolman's hill houses should have been brown brick to blend in and trees planted in backyards.

I had thought of a covenant on my 2 acres to preserve the wildlife habitat, but not if it is to be opened up to cats, dogs and humans.

There will be a loss of privacy, a further loss of wildlife and more robberies.

There are so many human walkways around Hobart. This rivulet is the only pathway left for the wildlife (& flora) that live so close to our capital city. Their numbers have already increased as the Tolman's Hill houses and the Waterworks Road unit developments have created a pincer effect. This section of the rivulet is still secluded for them. The pipeline track pretty much follows the sight of the rivulet and is well used. Why must we humans 'prettify' and 'humanize' the few natural habitats left for our wildlife?

I would appreciate a copy of you research findings. The Inspiring Place consultants made it clear they had only accessed the best way for a human pathway and that they had not considered (and had no data on) its impact on the local wildlife. I hope your own research considers all variables." R6

Group D: Not bordering the SBR and proposed track, and in favour (20 respondents or 27.8%).

"It's a community responsibility and they will only get behind it if there is a gain out of it. e.g. walking track. Keep people in the area to watch out for rubbish. Stop home owners backing onto the rivulet and using it as a dump for rubbish." R6

"*I looked at the plans at the council and noted that Romilly Street is going to be an alternative route to the connection at Kooyong Glen. But Romilly Street is extremely narrow, made more so because the lack of off-street parking forces residents to park on the street. Also, Ridgeway or the City (via Davey Street) tend to drive too bloody fast for the conditions. The narrowness, steep hill, blind corner and frost-prone (and incredibly slippery) bridge on Romilly Street are a danger to motorists, pedestrians, cyclists, small children, pets and native wildlife (including the rare Eastern-Barred bandicoot). Could the council please put speed humps on Romilly Street – especially if the new plans mean more pedestrians on the street – and improve parking arrangements fro rate-paying residents.*

Dogs must be on a leash and shit collected.

I am tired of the current thinking of; 'Let's stick a panel here/there/everywhere'. Panels can become eyesores, detracting from the beauty the panel is supposedly 'interpreting'. They can be patronizing, too.

I would prefer artwork like the 'totem poles' along Lenah Valley rivulet. I would like some say about the murals, interpretation and so on. The mural under the underpass is ugly." R10

If the Sandy Bay Rivulet Linear Park goes ahead, neighbourhood property prices will "*decrease for property's bordering the track and will increase for the suburb as a whole.*" *R16*

"An excellent idea!" R17

"Regardless if the Linear Park is successful Council should maintain rivulet environment, e.g. weed/ dead tree removal, rubbish etc." R19

Chapter 7: Discussion & Conclusion

This thesis sought to investigate community response to a draft proposal of a linear park and recreation trail along the middle section of the Sandy Bay Rivulet. Within urban planning and environmental conservation management, linear corridors and networks of reserved areas, particularly along waterways, are being considered and valued. Linear parks or 'greenways' provide a broad range of social, economic and environmental benefits. These natural corridors through the landscape are essential to maintain biodiversity and providing ecosystem services such as protecting water and air quality, while serving as potential community recreational open spaces and networks. Consequently they are enjoying some degree of worldwide popularity; China, Japan and the United States all have excellent examples-even though their use is still often isolated.

Contact is important to engage people about their concerns, to aid design and to foster a sense of ownership and/or stewardship towards projects such as the proposed linear park. The public can play an important role in identifying goals for a greenway or linear park project through; discussions at public meetings, by comments solicited through local newspapers, organizational newsletters, surveys, or questionnaires, or through interviews with knowledgeable individuals such as local officials. Along the Sandy bay Rivulet this process has occurred through previous studies, most recently the Draft Feasibility Study (2006), Catchment Management Pan (2002), and Waterworks Valley Management Plan (1999). This thesis is the largest with 72 responses from 260 community surveys.

7.1 Findings

Of the 72 replies from the 260 residents surveyed, 61 (85%) replied that they are in favour of the proposed Sandy Bay Rivulet Linear Park. Directly adjacent to the proposed park; 6 (8%) were against, and 5 (7%) were unsure. All those respondents not directly on the proposed route were in-favour.

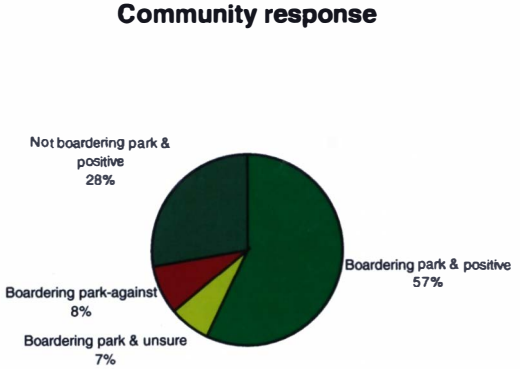


Figure 10. Community Response: Proportion of respondents as a function of proximity to the rivulet, and opinion towards the proposed SBR linear park.

Of the 260 community surveys letter dropped, 72 were returned, giving a 28% return rate. A number of management options were considered and most agreed on community access to the rivulet, while trying to balance residents and landowners rights. The overwhelming majority of the community reply's;

- Values/uses, and would like more local recreational networks, principally managed for passive recreation.
- Agree with riparian rehabilitation with native vegetation, including gradual and 'sensitive' willow removal in consultation with land owners.
- Disagree to leaving the rivulet as it is, and are undecided about using the rivulet as a natural park, rather than primarily a walking access to other places.
- Strongly agree to the proposed Sandy Bay Rivulet Linear Park
- Agree to extend the park down between Parliament Street and Regent Street, but are partially undecided due to a lack of knowledge of this stretch.
- Agree to; upgrading existing informal tracks to a cycle, wheel-chair and pram standard where feasible, seek funding, strengthen Neighbourhood Watch, more murals (unlike the existing one), and interpretation panels on local history and natural interests.
- Agree to a community orchard /garden,
- Strongly agree with maintaining the tree skyline with many resenting the new 'skyline' Tolman's Hill subdivision.
- Are undecided about Council compulsory acquiring access, and agree with compensation being paid if land is acquired.
- Favour voluntary conservation and public access agreements/covenants, which reward owners in line with the degree of permanency of the agreement/covenant, via rates and land tax deductions.
- Think that the proposed park will increase the value of neighbouring properties, with the possible exception of a small number of residents adjacent to the rivulet.
- Are undecided about being adequately included and informed in the planning process.

A small group of residents (8%) located on the rivulet did not agree, or were unsure (7%) about the above findings and generally want the rivulet to remain as it is.

Property Values

If the Sandy Bay Rivulet Linear Park goes ahead, neighbourhood property prices will "*decrease for property's bordering the track and will increase for the suburb as a whole." R16*

The finding that most residents thought that neighbourhood property prices would increase is in line with other findings that; "The recent literature and research in this area indicates that greenways consistently provide desirable community amenities which can protect local environmentally sensitive areas in a manner that does not reduce adjacent land values." (Quayle & Hamilton, 1999, p. i)

"The statistical results indicated an order of magnitude of a 10% to 15% increase in value, after controlling for other factors such as age, location, and other adjacent amenities." (Quayle & Hamilton, 1999, p. 34) This study went on to note further indications of increased land value such as quicker sales, and lower turn over rates. These have other additional benefits such 'wellbeing' and "more stable neighborhoods, with all of the intrinsic and indirect benefits of a greater sense of common ownership, comfort and security (which we otherwise end up paying for)." (Quayle & Hamilton, 1999, p. 34)

In reality a small number of properties may loose some financial land value, as well as some intrinsic values such as privacy and security.

Demographics & Comments

Of respondents approximately 58% were female, with the majority living as a couple with one child (0.7). They have been residents of the survey area for 8 and a half years. They own their home and were in the 30-45 age group. Just under one in three had been an active member of a community organization. There appears to be a strong correlation between the presence of a greater number of children influencing a positive response to the proposal. There is a weak or possible negative correlation to favouring the proposed park and owning ones own home. There appears to be little or no correlation between residents opinion towards the linear park and the duration of their residence.

There appears to be a positive correlation between resident's age and their opinion of the proposed linear park. On average, those for the park were in the 30-45 age bracket, while those unsure or against, were in the 46-60 age bracket. It is hypothesised that age may have an effect on issues such as security, with older residents feeling more vulnerable. There appears to be no correlation between the extent of community group participation and opinion of the proposed linear park.

The comments give an indication of the range of opinion towards the management of the Sandy Bay Rivulet. Concern at issues of security, vegetation removal, privacy, noise and maintenance were common throughout the community. Less common and generally restricted to group C (8% against) and B (7% unsure), were issues of public access and riparian landownership, property values, and ecological / wildlife disturbance.

While the majority supported the proposed linear park, there were a small minority of residents who were unsure or against it. This group of directly adjacent residents where extremely angry and concerned over the proposed linear park. Most expressed indignation at the idea of removal or infringement of riparian property rights. There was concern that the drafted Linear park Feasibility Plan (2006) would result in a perceived loss of intrinsic values and property values. These included; rehabilitation affecting the presence of willows largely responsible for providing privacy, public access potentially significantly diminishing security, and increasing the incidence of anti-social behaviour.

Implications

People are naturally attracted to waterways and flowing water. It helps define the landscape and connects them to the environment. Environmental awareness and the preservation and enhancement of urban waterways are now seen as essential components of the decision-making process in land and water management (Leggett 2002). A rehabilitated rivulet and developed linear park would have social and economic values that are inextricably liked with environmental and cultural values, including;

- riparian vegetations role in maintaining health of waterways (water quality and biodiversity)
- visual and aesthetic beauty
- a role in tourism, transport and recreation
- research and education
- cultural identity and intrinsic values such as sense of place
- overall increase in neighborhood property valuation

There will be negative impacts to some local residents include a potential loss of intrinsic values such as privacy and an increase in the crime rate. This may lead to a potential devaluation of property.

7.2 Addressing the Research Aims and Objectives

The first research aim, of conducting community consultation, was accomplished with the results of the community survey being reported. The second aim of reviewing the legislative, management, planning process and structures in relation to riparian open space along Sandy Bay Rivulet, was achieved in Chapter 5. The results from the community survey were analyzed and presented in chapter 6. The findings were then discussed and conclusions drawn in this chapter 7. Of the initial aims, only the recommendations lie ahead.

7.3 Limitations & Lessons in the Research Process

There have been some limitations and lesson learnt through the research process. For example, the content of the community survey could have refined and simplified somewhat, e.g. in questions, replacing the 'You favour' to a more neutral or less leading phrase such as 'what do you think of'.

7.4 Recommendations & Opportunities

In summary, the majority (85%) of the community surveyed is in favour of the proposed Sandy Bay Rivulet Linear Park. This includes strengthening setbacks and protecting the riparian zone from development while managing for; public access for passive recreation, rehabilitation and maintenance in partnership with the community.

Specific recommendations

- Consult adjacent property owners before works.
- Establishing a longer term plan for the sub section between Parliament Street Park to Regent Street Exploring a possible hanging walkway, similar to Humprey's Rivulet, along the constricted section, thus allowing the trail to begin at Regent Street.
- Change any pedestrian crossing point from the top of the hill on Regent Street to the bottom of the hill section, closer to Queens Street.
- A landscape plan for proposed Linear Park to include Totem poles, similar to Lenah Valley Track.
- Speed humps along Romilly Street and Waterworks Road.
- The linear park to be a potential dog on lead area.
- Educate public on shared use courtesy (e.g. cyclists on walking track).
- Security measure including; no stop of or facilities such as toilets to encourage unwanted congregation of individuals, adequate lighting, lines of sight, security patrols.
- A pedestrian suspension or smaller scale wooden bridge at the bottom of Kooyong Glen.
- Purchasing the property at the end of Kooyong Glen as part of the linear park.
- Considering fire management in light of re-vegetation efforts, especially within the Waterworks Valley.

- A cat trapping and education program: Unrestrained cats and dogs continue to frequent the proposed park area, taking a heavy toll on native species. Education programs, trapping and suitable fencing (for dogs) would help to alleviate this problem.
- Continue to seek threatened species and other funding opportunities.
- Including strata titles in relation to 5% open space sub-division requirements.
- Sandy Bay Rivulet Information packages concerning the linear park, landowner rights and responsibilities, riparian land-use and management options, such willow removal, in conjunction with local conservation and community groups.
- Increased partnership with the University.
  1) Sharing of internal information such as HCC consultants reports. (Although this does possibly raise issues of intellectual property, conflict of interest / duty of care, and right to information under freedom of information laws.)
  2) University water testing to be incorporated into Waterwatch and Derwent estuary, stormwater and water quality program.
- Waterwatch to continue through Princess Street Primary School and the Waterworks Valley Landcare Group.
- Amend the City of Hobart Planning Scheme to implement open space policies in light of the open space strategy and study.
- Possible HCC GIS planning scheme database with multiple issue integration and simulation. For example, fire management; access, public safety, transport, recreation, natural and cultural values such as threatened species habitat and heritage values.
- An assessment of the aboriginal cultural heritage has never been undertaken (Sinclair Knight Merz, 1999). The Aboriginal Heritage Office, within the Department of Tourism, Parks, Heritage and the Arts, may be approached to conduct a formal investigation into the area.

7.5 Conclusion

Hobart's hilly topography lining the Derwent River has resulted in a city split by water and fringed with natural bush land. This has created one of the most scenic harbour cities in the world, with a natural backdrop of a looming mountain surrounded by forested hills. The Sandy Bay Rivulet and its catchment has a range of outstanding cultural and natural features, and in partnership with the local community, provides an ideal opportunity to create a linear rivulet park or 'greenway'. This may yet add another section to Hobart's green space network and augment the sustainable city notion. Whether a waterway 'right of way' scheme can be implemented on a statewide basis is questionable. Mapping and auditing of Tasmania's rivers is continuing and suitable stretches will continue to be rehabilitated and potentially developed as community recreation and conservation networks. Riparian zones and vegetation, headwaters and upper catchments will hopefully continue to be valued within landscape and natural resource management. It can be argued that there is a global awareness and associated trend towards protecting environmental integrity, especially water resources as well as enhancing urban recreation and transport opportunities. This is translating into wider riparian buffer zones often serving as conservation corridors and recreational community open space networks. An example of this sustainable landscape management trend is the Sandy Bay Rivulet. There is a range of ways of valuing urban waterways, offering challenges to their management and research. To be truly integrated, a number of disciplines need to be drawing together. The scale of a study or area of management is a critical consideration and ideally should be considered on a catchment level.

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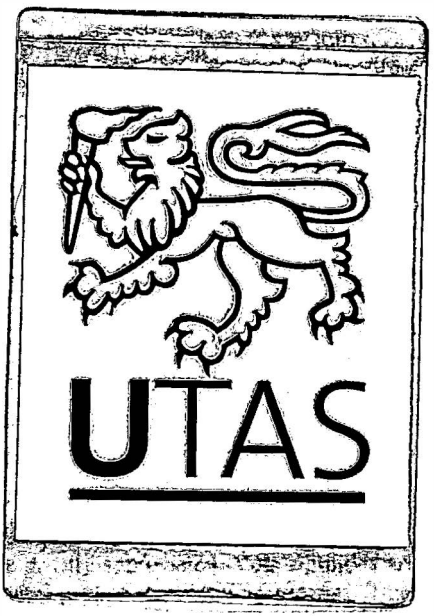

Appendix 1.

School of Geography and Environmental Studies
University of Tasmania
October 2006

INFORMATION SHEET

Surveying community opinion to land-use along Sandy Bay Rivulet and the proposed Park

You are invited to participate in a research survey. I am George Crozier, an Environmental Management Masters candidate at the University of Tasmania, under the supervision of Dr Emma Pharo from the School of Geography and Environmental Studies. For my research thesis I am investigating community attitudes towards current land-use, and the proposed park and track along Sandy Bay Rivulet. In addition, my research includes reviewing the current planning processes and management structures.

As a local resident of the Sandy Bay Rivulet, you are invited to complete the attached questionnaire. It asks some basic demographic information for profiling purposes, as well as your views on the current and future land use along the rivulet.

The questionnaire will take approximately 20 minutes to complete and completion is voluntary. The questions are asking primarily for your opinion – there are no right or wrong answers. The completed questionnaires will be securely stored on University premises for 5 years before being destroyed. Please note that as the questionnaires do not request your name, you will not be identifiable in how the research output from this study is reported. If you wish to be involved further with this project you may volunteer your details.

Once you have completed the questionnaire, please return it in the reply-paid envelope provided. Return of the questionnaire will be considered as your consent to participate in the survey. If you have any questions regarding the study, or would like to receive a summary of the research findings, please contact me (details below). Alternatively, you may contact my supervisor, Dr Emma Pharo, 62 26 2049.

This study has received ethics approval from the Human Research Ethics Committee (Tas) Network. If you have any concerns about the manner in which the study is conducted, these can be directed to the Executive Officer of the Network, Marilyn Pugsley, 6226 7479.

Your participation will be greatly appreciated. Your opinions are important in helping gather the information that is a vital part of the planning process. Thank you in advance for your participation.

Yours truly,

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